Fig. PA1: MAGNET-Automated Contracting System
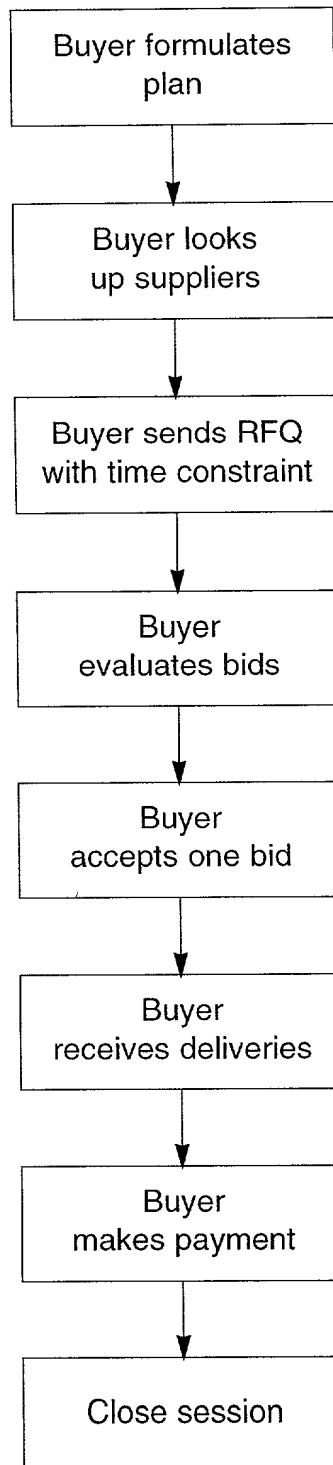
```
┌─────────────────────┐
│   Buyer formulates  │
│        plan         │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│     Buyer looks     │
│     up suppliers    │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│   Buyer sends RFQ   │
│  with time constraint│
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│       Buyer         │
│   evaluates bids    │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│       Buyer         │
│   accepts one bid   │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│       Buyer         │
│  receives deliveries │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│       Buyer         │
│   makes payment     │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│   Close session     │
└─────────────────────┘
```

Fig. PA2: Fishmarket
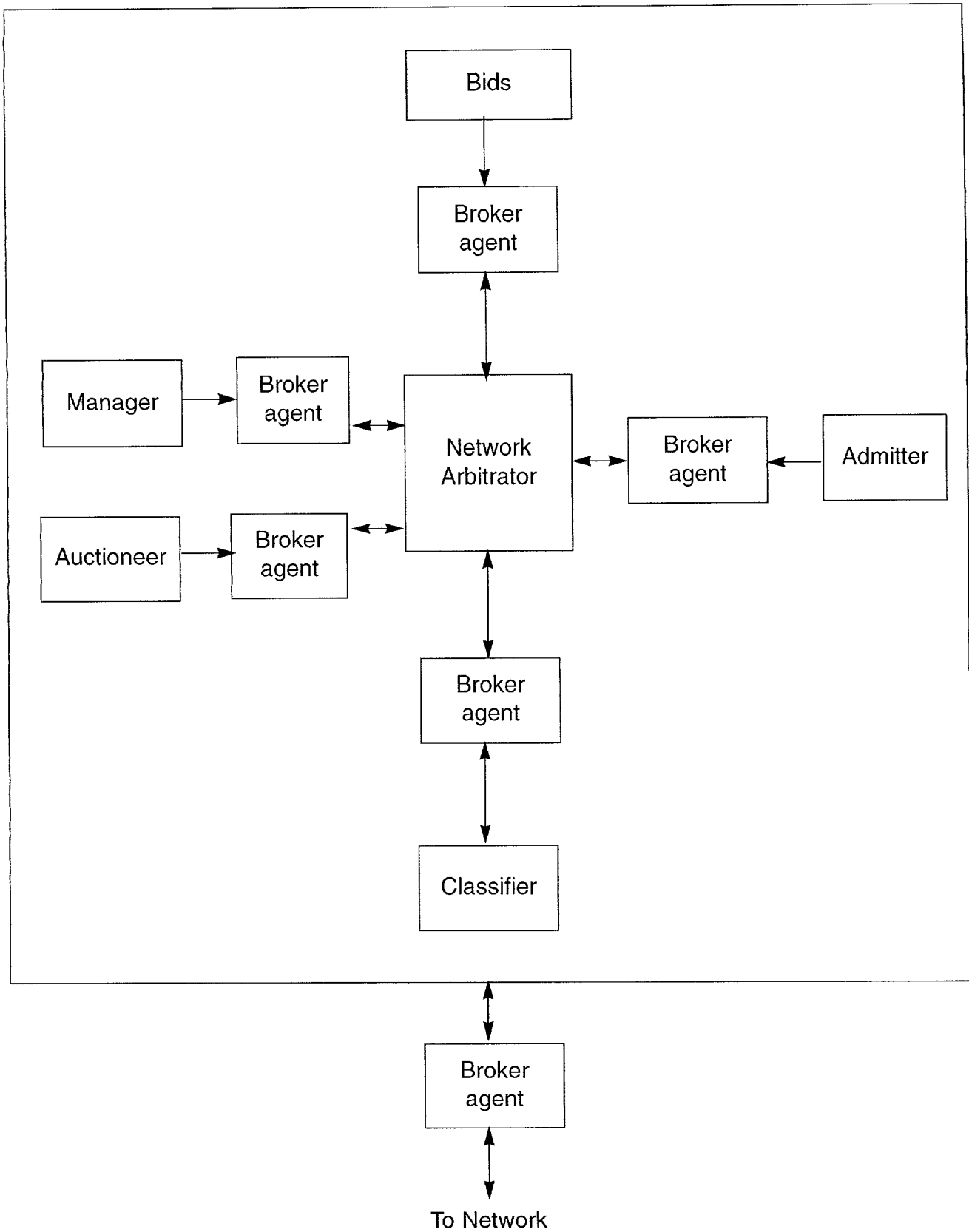
Fig. PA3: Kasbah Marketplace

Marketplace

Sellers

Buyers

Function

of

"matching"

of

interests

(State
interests)

(State
interests)
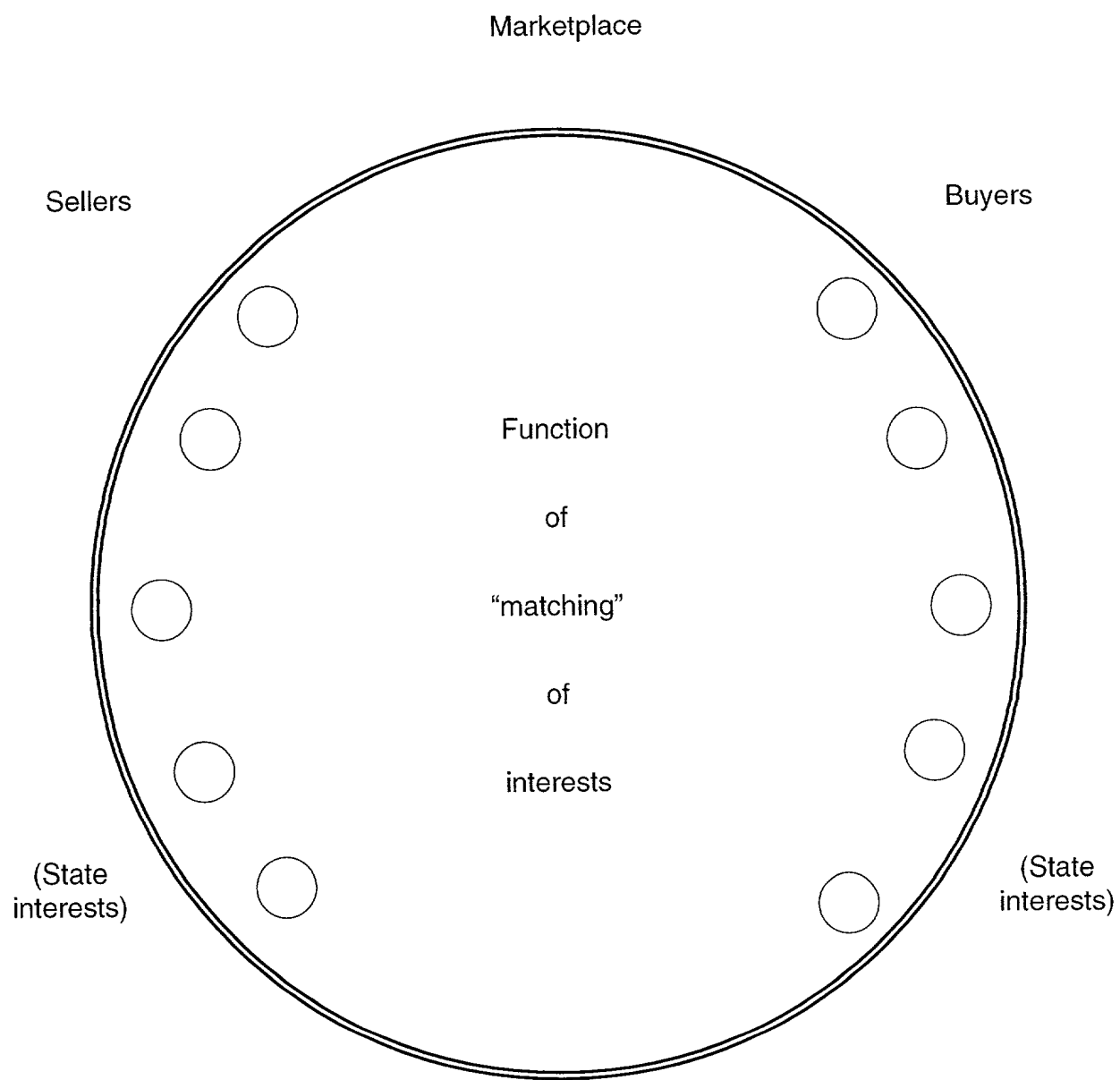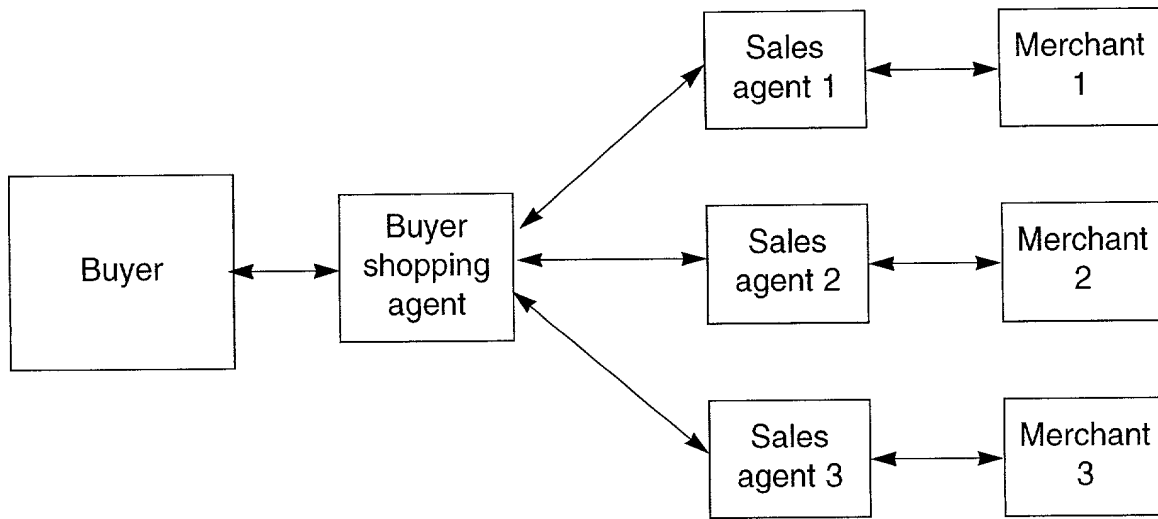
Fig. PA4A: Tete-a-tete (I): Integrative Negotiation
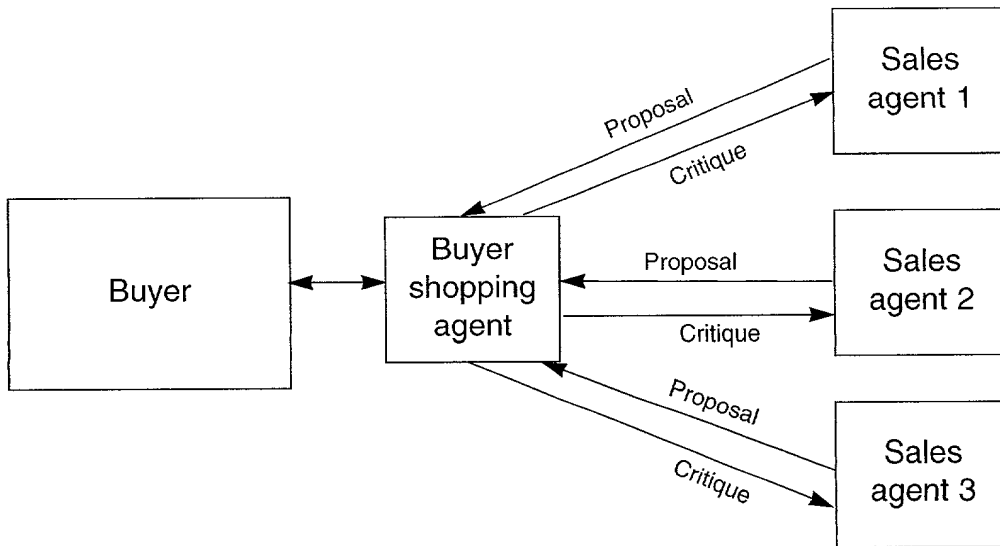

Fig. PA4B: Tete-a-tete (II): Bilateral Negotiation

Fig. PA5: Contract Net–4 Stages of the Contract Net

Stage 1:
Request for
tenders

Buyer → Request for tenders → Seller A, Seller B, Seller C, Seller D

Stage 2:
Submission
of proposals

Buyer → Sellers provide proposals ← Seller A, Seller B, Seller C, Seller D

Stage 3:
Awarding
of contract

Buyer → Buyer selects winner → Seller C; Seller A, Seller B, Seller D

Stage 4:
Establishment
of contract

Buyer → Buyer & seller establish contract with selected proposal ← Seller C; Seller A, Seller B, Seller D

Fig. PA6: Flow Chart Of Contract Net Protocol

```
                        ┌──────────────┐
                        │    Buyer     │
                        └──────┬───────┘
                               │
                               ▼
                        ┌──────────────┐
          ┌───────────► │ Buyer requests│
          │             │ for bids sent to│
          │             │    sellers    │
          │             └──────┬───────┘
          │                    │
          │                    ▼
          │             ┌──────────────┐        ┌──────────┐
          │             │ Bids received from │─────►│ Refuse   │
          │             │ interested sellers │     │ all bids │
          │             └──────┬───────┘        └──────────┘
          │                    │
          │                    ▼
          │                  ╱─────╲
          │                 ╱ Accept ╲
          │          No    ╱   bid?   ╲    Yes
          │       ┌───────◄            ►───────┐
          │       │        ╲         ╱         │
          │       │         ╲───────╱          │
          │       ▼                             ▼
          │  ┌──────────┐              ┌──────────┐
          │  │  Reject  │              │  Commit  │
          │  │   bid    │              │          │
          │  └────┬─────┘              └──────────┘
          │       │
          └───────┘
```

Fig. PA7A: EDI As A Paper Replacement Technique

Point of sale

EDI order sent

Payment authorized

Payment authority requested

Inventory credited

Order sent for shipment

Buyer

Seller

EDI Invoice

Accounts payable

Payment sent
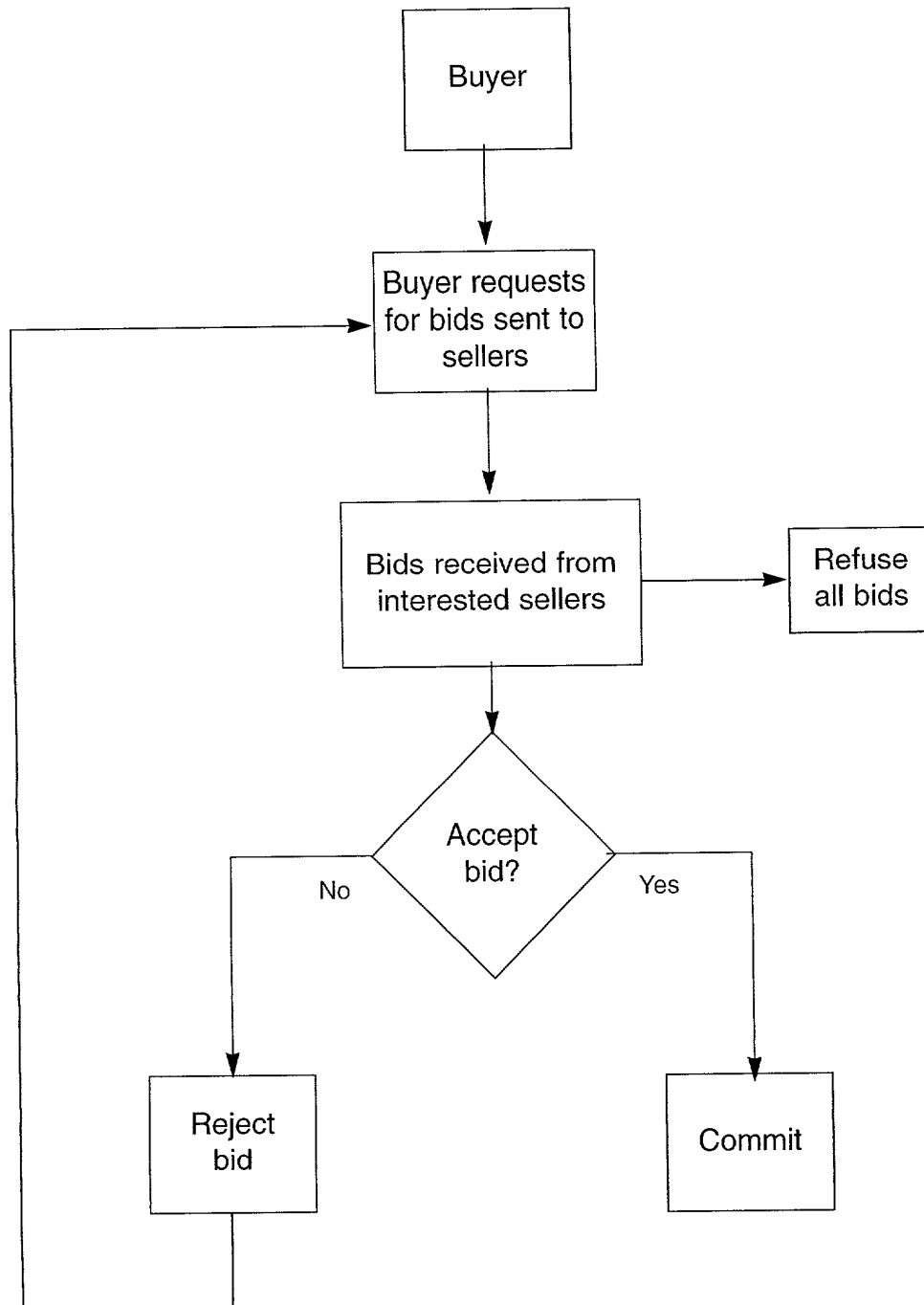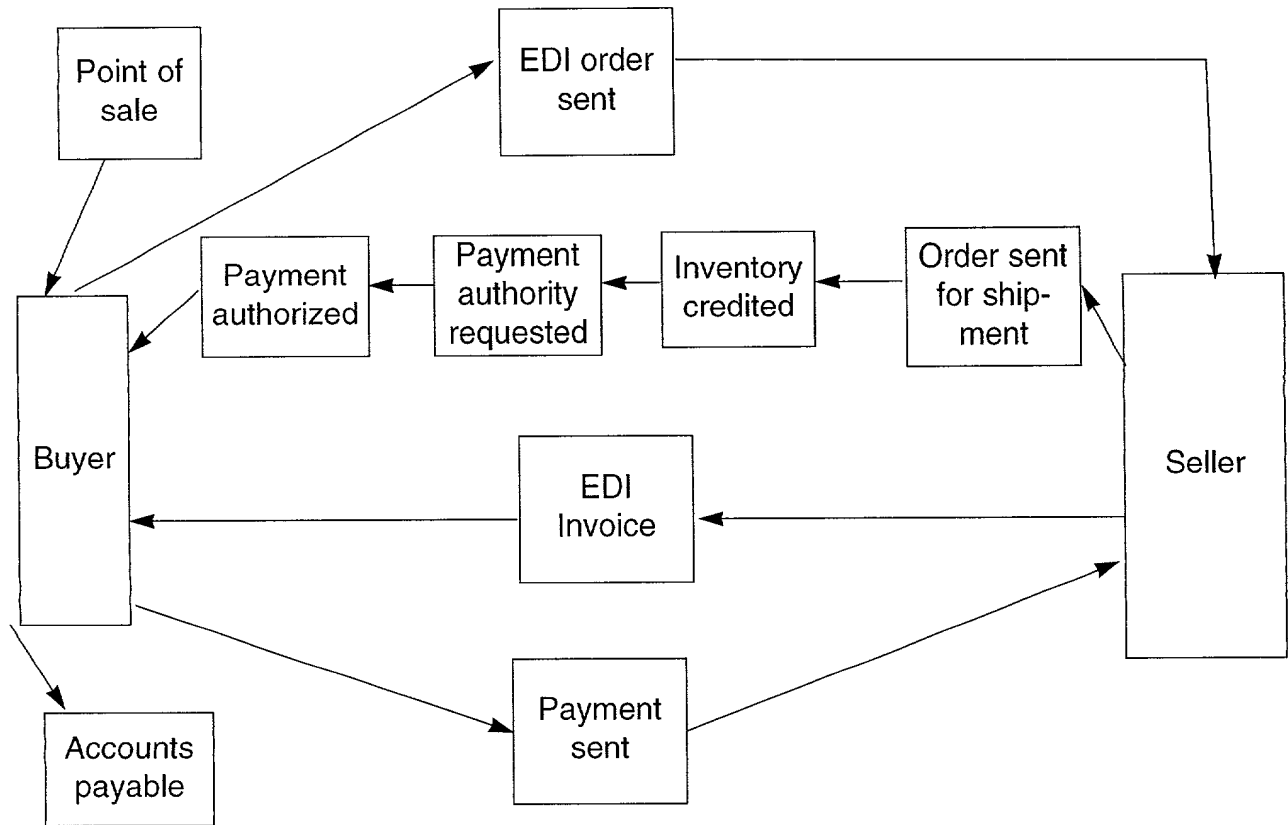
Fig. PA7B: EDI As A Process Elimination Technique

Remit advice

Advance ship notice

Buyer

Seller

Advance ship notice

Receiving

Goods shipped

Payment order

Bank

Payment

Fig. PA8: ECN (Electronic Communications Network)

Distinct data sources

Data is "pushed"

A   B   C   D

Central database

Real-time stock execution

Multivariable analysis

Trades are executed on price only

A   B   C   D

Fig. PA9A: Intermediated Demand-Initiated Procurement System

I. Specific Service Selected (1,2,3)	II. Specific Equipment Selected (5,6)	III. Application Bundles Selected (4a,c)	IV. Service Bundles Selected (1,2,3,4b))
Enter Service Features	Enter Equipment Features	Enter Application Services Features	Enter Service Features

(3x)

Select at least 4 vendors from appropriate list of choices

System sends bid requests to at least 4 vendors

X M L/UDDI

Send bid request	Send bid request	Send bid request	Send bid request

X M L/UDDI

System receives bids: Software agents interact with vendor databases (may be manually overridden) or establish real time connection to vendors' databases

(3y)

Present bids in spreadsheet comparison chart

Reject all
Choose different vendors

Customer narrows down to at least 2 vendors

From

Yes

Fig. PA9B: Continued

Customer counters on basis of different features, pricing or quality

Yes

No

3z

Present new requests to 2 vendors

Customer narrows selection to 1 vendor

Vendors

2 Vendors bid

1 or 2 vendors bid

1 vendor bids

Vendor(s) bid

Customer counters?

Yes

No

Present counter bid to 1 vendor

Customer Chooses 1 Vendor

Yes

No

Vendor counters?

Counters

Declines

Accepts

3y
Spreadsheet of bids

New Bids/ Vendors?

3x
Chose new vendors

Customer confirms bid?

No

Yes

Note: At any time, customer may go back a step or two instead of to the top

Customer modifies request?

Yes

No

Save bid for later retrieval

2. Information Module

4. Transaction Processing

Fig. PA10: Traditional Supply Chain & Customer Relationships

(Small Company Consumers)

Customers

(Buyers)

upstream

| Small company consumer 1 | Small company consumer 2 | Small company consumer 3 |

CRM

ERP

Big Company

(seller)

(buyer)

downstream

Suppliers

Procurement

e-sourcing

SCM

(Sellers)

| Small company seller 1 | Small company seller 2 | Small company seller 3 |

(Small Companies)

Fig. PA11: Traditional Search Technology

Query

Spider

Spider

Central database:
Organized by keyword
and category

Spider

Spider

Result of query in
order of priority

Fig. PA12: Distributed Search Approach

Database 1   Database 2   Database 3   Database 4

First search query sent to set of
distributed database

Search results evaluated by
weighted criteria

Search results displayed
in ranked order

Fig. PA13: Traditional Aggregation

Plurality of customers
select specific product

Vendor provides better unit
price based on increased
number of customers in
specific time frame

At end of term, customers
accept product price

Transaction
Processing

Fig. PA14: Intermediated Option Contracts

Customer selects item at
offer price & time deadline

Vendor waits
for better price if
before present
deadline

Vendor sells item to another
buyer at a higher price than orig-
inally agreed with first customer
by original deadline

Vendor sells item to original
buyer at agreed price

Vendor gives original cus-
tomer a pre-agreed fee as
penalty for not selling item
at original price by the
deadline

Transaction processing

Fig. 1: CCN Architecture

Corporate Data Inputs

Market Data Inputs

1005

1010

1013

Main Corporate Databases

DB1

DB2

Firewall

Seller-AA

Buyer-AA

1025

Set Parameters

1020

1030

Promotion & RMO modules

1015

S-IAs

Customer GUI

1035

Collabo-ation

1040

1045

Data as objects/codes

Seller Site Showcases

SC1

SC2

1050

S-IAs

1055

Pre-negotia-tion

Buyer Inter-agent

1060

Commercial Search Agent (CSA)

1065

Price, negotiation & auction modules

1080

1085

Price, negotia-tion & auction modules

1070

1090

S-INA 1

S-AA

S-INA 2

B-INA 1

B-AA

B-INA 2

1075

1095

1100

S-ITA

B-ITA

1105

1110

End Transaction

1115

Fig. 2: CCN System Layers

Layer		
1 Front-end		
2 Show-case		
3 Anal-ytics		
4 Inter-Agency		
5 Search		
6 Nego-tiation		
7 Trans-action		

Layer 1 Front-end: Corp. data-bases 1116, Customer GUI 1118

Layer 2 Show-case: Showcase databases 1120

Layer 3 Analytics: S-AA 1122, RMO's 1124, B-AA 1126, Promo-tions 1128

Layer 4 Inter-Agency: S-IA 1130, Collabor-ation 1132, B-IA 1134

Layer 5 Search: CSA 1136

Layer 6 Negotiation: S-INA 1138, S-C-INA 1140, D-INA 1142, B-C-INA 1144, B-INA 1146

Layer 7 Transaction: S-ITA 1148, B-ITA 1150

Fig. 3: Showcase Database System

Fig. 4: Multiple Vertical Databases

1255

1260

Showcase	Showcase
Showcase	Showcase

Specific Industry A

Showcase	Showcase
Showcase	Showcase

Specific Industry B

Showcase	Showcase
Showcase	Showcase

Specific Industry C

Showcase	Showcase
Showcase	Showcase

Specific Industry D

Fig. 5: Showcase Database View

Fig. 6: Showcase Database Operation

Fig. 7: Showcase Data Flow

1355

S-IA receives data sets from corporate database and from S-AA

1357

S-IA filters data by analyzing optimal data to be included in showcase database

1360

Data is imported from S-IA to showcase

1362

S-IA continually updates showcase by inputting new data and purging old data

1365

Real time data sets in showcase as always current

Fig. 8: Inter-agent System Architecture

Fig. 9: Rivers of Data Flows

Fig. 10: CSA System Architecture

Fig. 11: CSA First Query Sequence

Market Data 1552

1555 Showcase db1 — 1583 S-IA → 1585 Promo's & RMO's

2a

1560 Showcase db2 — S-IA → 1590 Promo's & RMO's

2b

1565 Showcase db3 — S-IA → 1595 Promo's & RMO's

2c

1570 Showcase db4 — S-IA → 1600 Promo's & RMO's

2d

1575 Showcase db5 — S-IA → 1605 Promo's & RMO's

2e

1580 Showcase db6 — S-IA → 1610 Promo's & RMO's

2f

(1)

1620 B-Analytical Agent

3a   3b

1625 CSA

4a 4b 4c 4d 4e 4f

5a

5b

5c

6

1630 B-Inter agents

7

1635 Negotiation sessions

Fig. 12: Programmability of CSAs for Priorities of Search

```
          ┌─────────────────────┐
          │        CSA          │  1700
          │     activated       │
          └─────────────────────┘
                     │
                     ▼
          ┌─────────────────────┐
          │   CSA makes first   │   1710
          │    search query     │
          └─────────────────────┘
                     │
                     ▼
    ┌──────────────────────────────────┐
    │CSA uses filters to determine factor│  1720
    │   priority emphasis of search     │
    └──────────────────────────────────┘
                     │
                     ▼
    ┌──────────────────────────────────┐
    │ Search proceeds by sort-          │  1730
    │ ing of preferred attribute        │
    └──────────────────────────────────┘
                     │
                     ▼
    ┌──────────────────────────────────┐
    │ CSA accesses various showcases    │  1740
    │ according to Registry Code sequence│
    └──────────────────────────────────┘
                     │
                     ▼
    ┌──────────────────────────────────┐
    │ CSA sends out code seeking match by│  1750
    │      attribute to showcases       │
    └──────────────────────────────────┘
                     │
                     ▼
    ┌──────────────────────────────────┐
    │ Showcase sends back data matching │  1760
    │    relevant query attribute(s)    │
    └──────────────────────────────────┘
                     │
                     ▼
    ┌──────────────────────────────────┐
    │  CSA orders and ranks responses   │  1762
    │ according to configured preferences│
    └──────────────────────────────────┘
                     │
                     ▼
    ┌──────────────────────────────────┐
    │   CSA registers search results    │  1764
    │  to buyer GUI or directly to B-IAs │
    │            or B-INA               │
    └──────────────────────────────────┘
```

Fig. 13: CSA As Initial Search Query

1800 B-Analytical agent ↔ Commercial search agent 1805

First search request 1810

Showcase 1 1825

Showcase 2 1820

Showcase 3 1815

pre-negotiation 1830

B-INA 1845

S-INA 1 1840

S-INA 2 1850

Buy item now at first price? 1835

ITA 1855

Go to negotiation session 1870

Buy item now at first price? 1860

Go to negotiation session 1865

complete transaction

ITA

1880

complete transaction

Go to negotiation session 1875

yes

no

yes

no

Fig. 14: CSA Filters

CSA — 1900

Promotions and invitations from vendors — 1905

1910 — Manually configured search agent filters according to specific factors

- Item/bundle price range ← no
- Location ← no
- Item niche ← no
- Availability ← no
- Bundles/ packages ← no
- Accountability ← no
- Analysis of quantity of past experiences ← no
- Accuracy enhancement to focus search results

Several simultaneous factors selected

1920 — Micro-casting to specific customers

1925 — Promo's/RMO's Incentives/ discounts

1930 — Demand-shaping: Vendors seek to influence buyers with options and incentives

1945 — Discounts

1950 — Accelerated delivery

1955 — Analysis of quality of incoming data

1960 — (Adjustable) Purification of Data

Analysis of quality of incoming data — 1965

1970 — Several co-equal (comparable) choices generated

1975 — Negotiation Sessions

Fig. 15: Promotions

Fig. 16: Proximity Marketing For Mobile INAs

2040

Location of first
INA negotiation

2042

B-INA arrives at
specific location

2044

Promotion
module

2046

S-INA accesses database via an
S-AA to ascertain if B-INA fits a
specific promotional category

No

2048

Do not
provide
promotion

Yes

2050

S-INA offers B-INA specific,
time-sensitive promotions
at a specific location

Fig. 17: Promotional Discounting

2060

Products	
Cutting Edge	Trailing Edge

2050

CSA

2070

Services	
High Peak	Low Peak

2080

Bundles	Upgrades
Increased Quantity	Time-based

Fig. 18: Dynamic Pricing Model

Conditions:

- Product cycle rate
- Market/Economy
- Competition

Technology Pricing

-Products & Services

Cutting Edge

Peak Services

Trailing Edge

Off-Peak Services

Price →

Time ———→

Fig. 19: Pricing Discount Promotions

Dropping Prices Tendency

1. Trailing edge technology

2. Off-peak service

3. Bundled packages (aggregation-discounts)

4. Surplus items

5. Decreasing quality

6. Quantity discount (multiple identical items)

8. Un-time-sensitive

9. Decreased features

10. Exploding (Time-sensitive) offers

Fig. 20: Promotions Integrated with CSA & Showcase

Transaction based vs. Relationship based

2110

Advertisements

Ways to Promote

Push

Target

broadcast

custom

2120

Inducements

Invitation
(by seller)

Requested
(by buyer)

↓

↓

incentives

intentionality
(customer seeks item)

2130   Discounts ────────────────────────────────→

Cross-Selling

2140

Kinds of Promotions

-price
-quantity
-(bundles)
-time-based
-(upgrades)

multivariate

bundles

upgrades

Yield Management Services		Technological Decay Curve (Products)		increased quantity	time-based
High peak	Low peak	cutting edge	trailing edge		

2150

Fig. 21: RMO Contract Processes in Distributed System

2210

R → Seller S1 sells to Customer C1 on specified terms, before buying item from seller S2 (S1 agrees to pay penalty to C1 for not complying w/terms)

2220 Risk Priorities & Preferences

2215 Market Data

2225 Penalty for seller non-performance

2230 S1 looks for better price/terms than he sold to C1 from Customer 2 (C2) who will pay higher price/terms.

2235 Seller AAs (AI/NN)

2245 Dynamic pricing & analysis of peak and margin risks

2240 S1 sells to C2 at net higher price than C1

2250 Swapping risks with sellers for complementary penalties to limit downside risks

2255 Concentrating Risks

2260 Repackaging Risk

2265 C1 receiving penalty from S1

2280 Item Time sensitivity (diminishing returns)

Time shifting contingencies 2290

2270 Item Delay

2275 Item Cancel

2285 S1 commits to buy item from S2

2305

Diluting risks by diversification

2295 Penalty for Delay

2300 Penalty for Cancel

R

2310 S1 sells to highest buyer

2305

Fig. 22: Transaction Contingencies

INA Negotiation session: simultaneous negotiation processes of one buyer and multiple sellers — 2315

Buyer delays negotiation with sellers in order to focus on negotiation with another seller — 2319

2320 — Expression of interest by buyer and one seller

2321 — Buyer and seller agree

2326 — Seller to activate RMO contingency

2327 — Seller withdraws with penalty

2335 — Buyer end negotiation

2323 — B-ITA to close details and process transaction with expression of interest

2324 — Buyer and seller agree

2325 — Buyer contingency not performed

2329 — Buyer withdraws with penalty

2331 — Buyer not qualified according to S-ITA

2333 — Seller ends negotiation

2337 — Customer goes for 2nd best item available when most preferred item is unavailable

2315 — To top
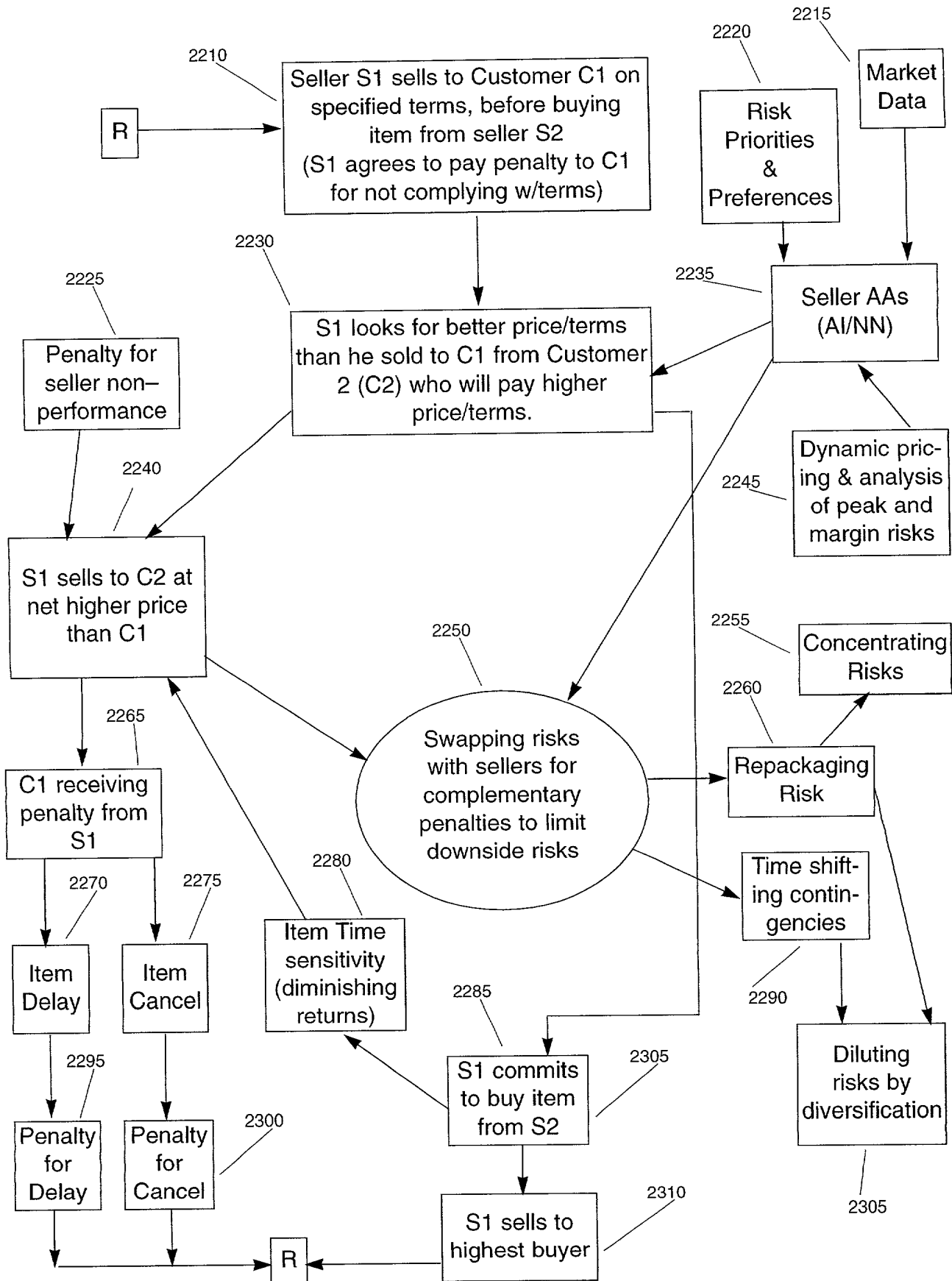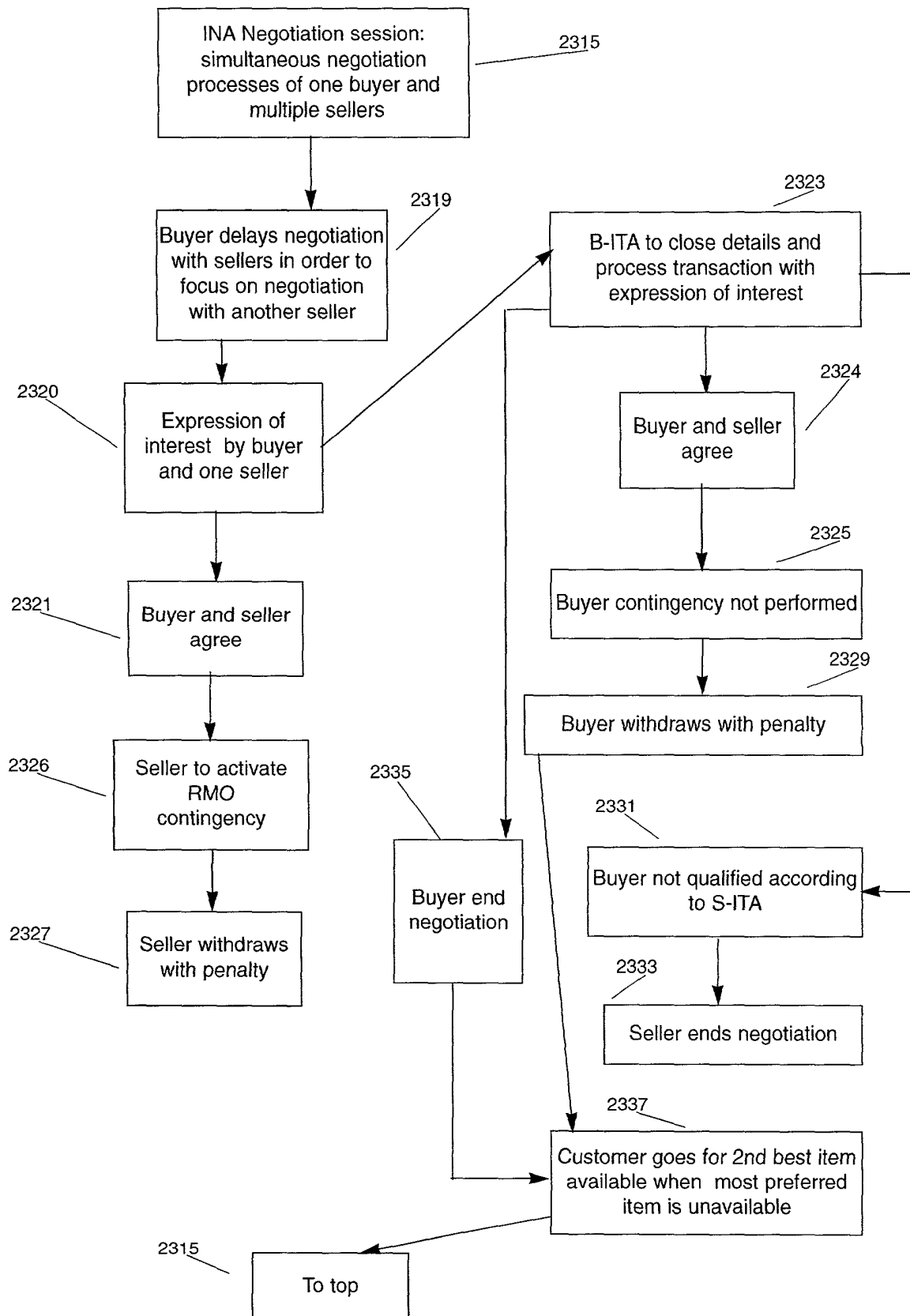
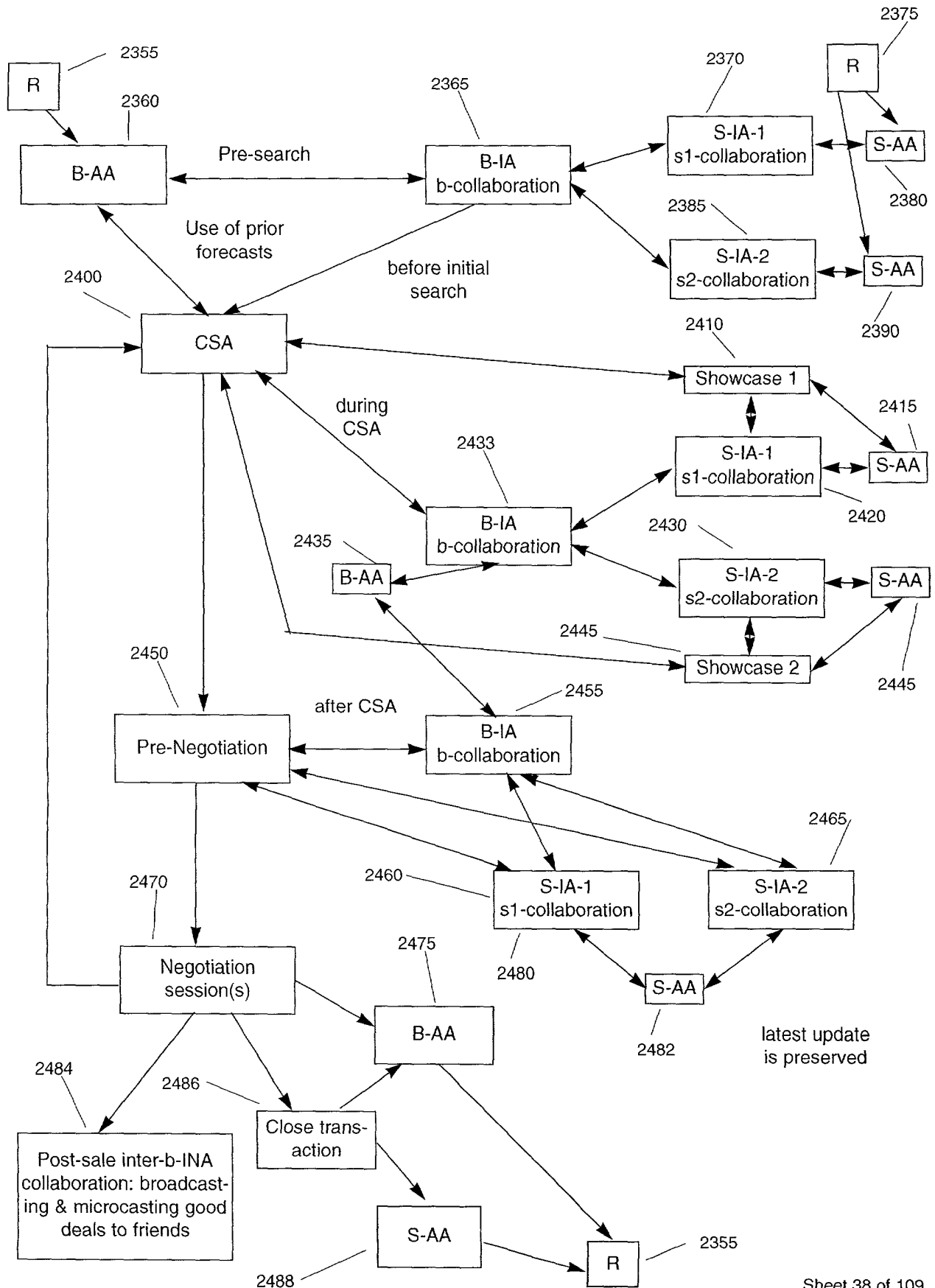# Fig. 23: Information Collaboration for MTO
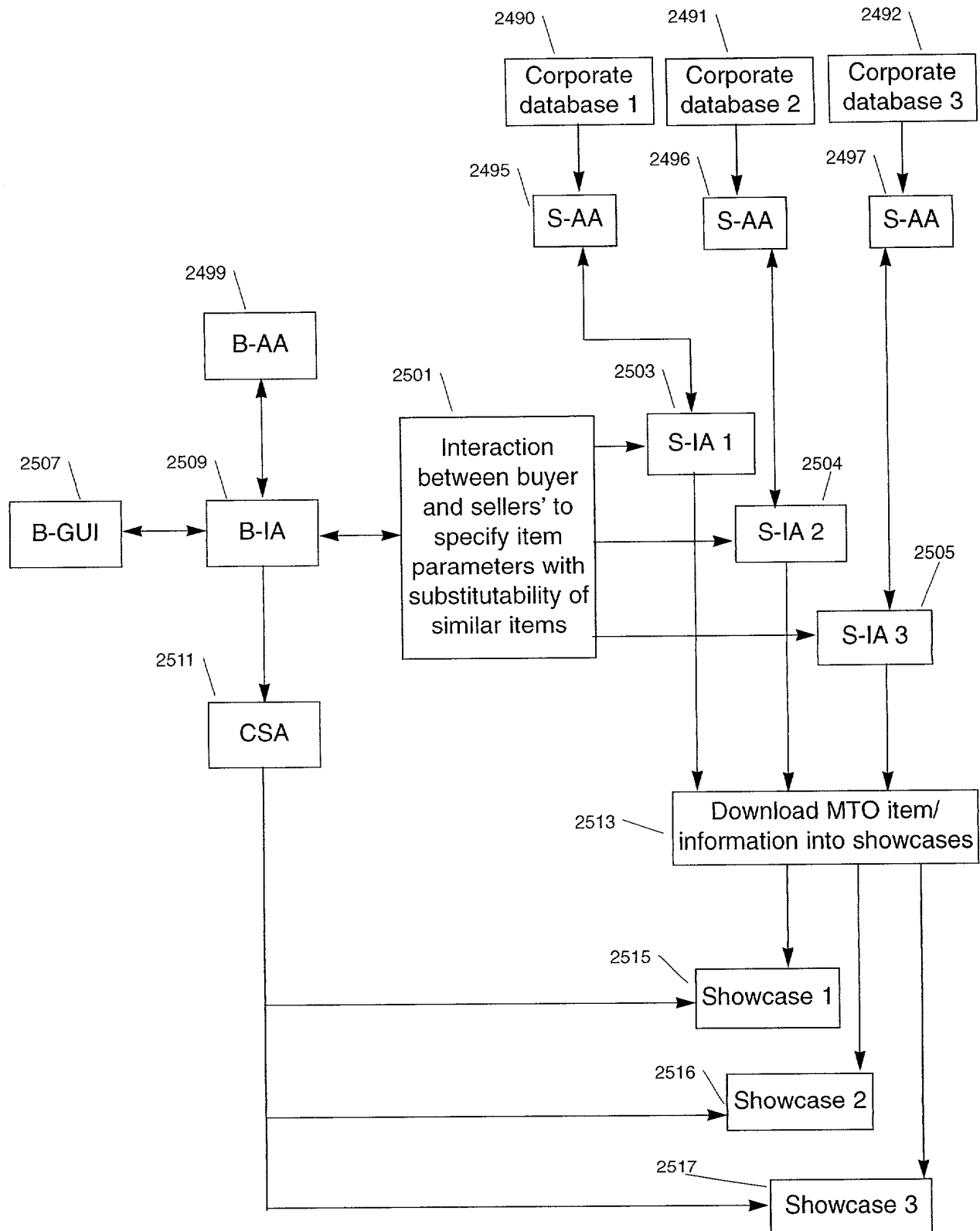
Fig. 24: Collaboration Process For MTO Customization

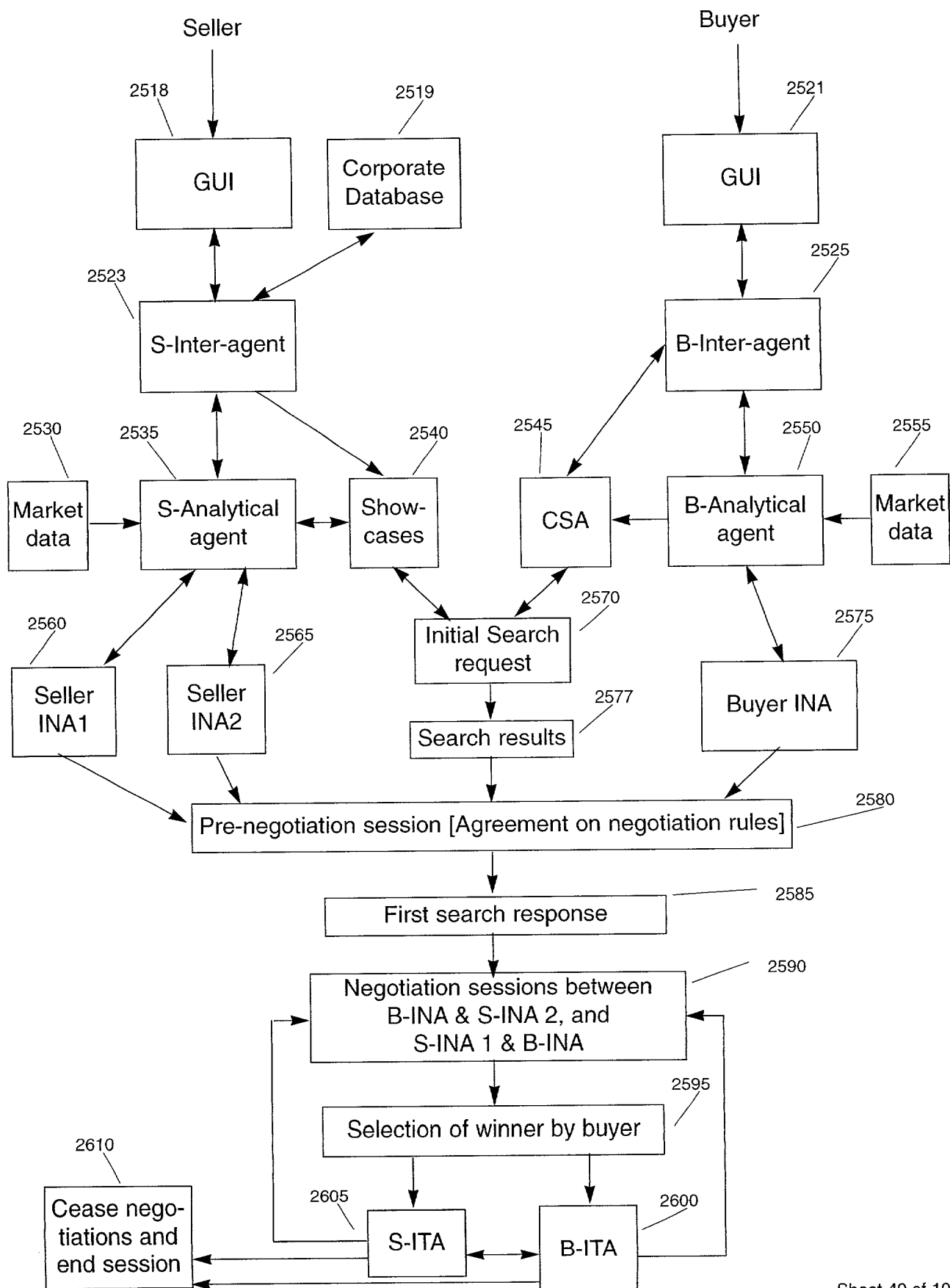# Fig. 25: INA Interaction (B-INA & S-INA Interactions)

Fig. 26: INA Interactions - Ricochet Model

```
2650 ──┐  ┌──────────┐
        │  │   CSA    │
           └────┬─────┘
                │
                ▼
2655 ──┐  ┌──────────────┐
        │  │ Initial search│
           │   request     │
           └──────┬────────┘
                  │
2660 ─┐ ┌────┐           ┌────┐ ┌─ 2665
       │ │ AA │           │ AA │
         └─┬──┘           └─┬──┘
           ↕                ↕      2680
2670 ─┐    │          2675 │        │
┌────────────┐  ┌──────────────┐  ┌────────────┐
│  S-INA 1   │◄►│  Showcases   │◄►│  S-INA 2   │
└─────┬──────┘  └──────────────┘  └─────┬──────┘
      │                                 │
      ▼                       2685      │
┌───────────────────┐      ┌────┐ ┌─ 2690
│      B-INA         │◄────►│ AA │
│ buyer counter bid to│     └────┘
│     S-INA1         │
└─────────┬─────────┘
          │               2695            2700
          ▼
┌───────────────────┐          ┌────────────┐
│     S-INA 1       │◄────────►│   S-ITA1   │
│ seller counter offer│        └────────────┘
└───────────────────┘
                          2705
┌───────────────────┐
│      B-INA         │
│ buyer counter bid to│
│     S-INA 2        │
└─────────┬─────────┘
          │          2710          2715
          ▼
┌───────────────────┐      ┌────────────┐
│     S-INA 2       │◄────►│   S-ITA2   │
│ seller counter offer│    └────────────┘
└─────────┬─────────┘
          │                      2725        2730
          ▼
┌───────────────────┐   ┌────────────┐  ┌────────────┐
│  Buyer accepts    │◄─►│   B-ITA    │─►│   Close    │
│  Seller accepts   │   └────────────┘  └────────────┘
└───────────────────┘
2720
```

Fig. 27: Pre-Negotiation

2755 — Customer requests terms of negotiation session

2760 — Buyer Interagent

2765 — B-INA

2770 — S1 first response

2775 — S2 first response

....

2780 — Sn first response

2785 — S(1,2, ...,n) pre-negotiate parameters of interactive session including location(s), protocols (language, translation, security, encryption, etc), double auction method, options, etc

no

2790 — Establish rules of negotiations & number of negotiation sessions, including options.

2795 — Independent multi-lateral 1-to-1 negotiation sessions between S1, S2, Sn and B-INA

Fig. 28: Time-Based Negotiation Strategy Concealment

Seller

Buyer

2905

First ask 1

2910

First ask 2

(quickly)

2915 (slowly)

First bid for buyer

2920

First counter from seller 1

First counter from seller 2

2925

(quickly)

(slowly)

2930

First counter offer by buyer

2935

1 seller accepts

(quickly)

2940

(slowly)

Buyer accepts

Fig. 29: INA Logistics

```
┌──────────┐        ┌────────────────────────────────────────┐  2965
│ Initiate │───────▶│ Initial agent generation and ID tagging│◀─────
│ Session  │        └────────────────────────────────────────┘
└──────────┘                        │
    2960                            ▼
              ┌────────────────────────────────────────┐  2970
              │ Agent interaction protocol generation  │
              └────────────────────────────────────────┘
                                    │
                                    ▼
              ┌────────────────────────────────────────┐  2975
              │ Translator for various agent based     │
              │ inter-communications                   │
              └────────────────────────────────────────┘
                                    │
                                    ▼
              ┌────────────────────────────────────────┐  2980      No
              │ Synchronization of INAs in negotiation sessions │──────┐
              └────────────────────────────────────────┘            │
    2985                            │                  2990          ▼
┌──────┐      ┌────────────────────────────────────────┐      ┌───────────┐
│  AA  │◀────▶│ INAs construct unique negotiation       │      │ Terminate │
└──────┘      │ strategies using AI                     │      └───────────┘
              └────────────────────────────────────────┘          2995
    3000                            │
              ┌────────────────────────────────────────┐
              │ Agents signalling intentions to negotiate with other agents │
              └────────────────────────────────────────┘
    3005                            │
┌──────────────────────────────────────────────────────────────────────────┐
│ INAs send out communication streams to "home", revealing locations, status & plans │
└──────────────────────────────────────────────────────────────────────────┘
                   ▲                │
              3010 │                ▼
      ┌────────────────────────────────────────────────────────────────┐
      │ S-INA 's & B-INA pre-negotiate to set rules for negotiation session │
      └────────────────────────────────────────────────────────────────┘
    3013                            │
      ┌────────────────────────────────────────────────────────────────┐
      │ B-INA launches micro-agents to negotiate with S-INAs at diff. locations │
      └────────────────────────────────────────────────────────────────┘
    3015                            │                              3023
      ┌──────────────────┐              ┌──────────────────────┐
      │ INAs negotiates  │─────────────▶│ INAs ceases negotiation │
      └──────────────────┘◀────         └──────────────────────┘
    3020        │              3025              │
      ┌────────────────────────┐         ┌──────────────────────┐
      │ B-INA & S-INA agree    │         │ Save INA settings for│
      │ to complete transaction│         │ later relaunch       │
      └────────────────────────┘         └──────────────────────┘
    3035    │           3040                        │        3030
      ┌─────────┐  ┌─────────┐                      ▼
      │  S-ITA  │  │  S-ITA  │              ┌──────────┐
      └─────────┘  └─────────┘       3045   │  Close   │ 3055
    3050    │           │                   │ Session  │
      ┌──────────────────┐  ┌──────────┐    └──────────┘
      │ Close Transaction│─▶│ Agent's self │──▶
      └──────────────────┘  │ termination  │
                            └──────────────┘
```

Fig. 30: INA Interaction Sequence #1

3075 → Initiate initial commercial search request

3078 → Display results

3080 → Initiate pre-negotiation session(s)   No

3085 → Initiate negotiation module for specific agents

3090 → Tracking each INA (if negotiation is mobile, track activity between machines an interaction of each agent with its home)

3095 → Winner determination

3105 → B-INA activates withdrawal contingency clause to be removed from contract obligation   No   3105 → Committing to contract

3110 → Close transaction with ITAs   No

Yes

3117 → Inform AAs about transaction   3115 → Save settings

3120 → Close session

Fig. 31: INA Interaction Sequence #2

```
                                3125
   3122                    ┌──────────────────┐
  ┌─────┐                  │                  │◄─────────────────────┐
  │ AI  │───────────────►  │ Buyer/Seller INA │                      │
  └─────┘                  │                  │                      │
     │       ╲             └──────────────────┘                      │
     │        ╲                                                       │
     │         ╲                              3135                    │
 3130│          ╲                        ┌──────────────────┐        │
     │           ╲                       │                  │        │
     ▼            ╲                      │  Pre-negotiation │        │
  ┌──────────────────┐                   │   session(s)     │◄──┐    │
  │                  │───────────────►   │                  │   │    │
  │ Analytical Agents│                   └──────────────────┘   │    │
  │                  │                      │          │        │    │
  └──────────────────┘             3140     │          │   3150 │    │
                                 ┌──────────┘          │        │    │
                                 ▼                     ▼        │    │
                         ┌─────────────┐        ┌─────────────┐ │    │
                         │             │        │             │ │    │
                         │   S-INA 's  │        │   B-INA 's  │ │    │
                         │             │        │             │ │    │
  3145                   └─────────────┘        └─────────────┘ │    │
     ╲        ╱                                        │        │    │
      ╲      ╱                                         │        │    │
  ┌──────────────────┐                                 │        │    │
  │                  │                                 │        │    │
  │   S-INA access   │                                 │        │    │
  │  Pricing Module  │                                 │        │    │
  │                  │                                 │        │    │
  └──────────────────┘                                 │        │    │
          │                                            │        │    │
  3155    │                                            │        │    │
     ╲    ▼                                            ▼        │    │
  ┌────────────────────────────────────────────────────────┐   │    │
  │          INAs access negotiation module                │   │    │
  └────────────────────────────────────────────────────────┘   │    │
          │                                                     │    │
          │                               3165                  │    │
  3160    │                          ┌──────────────────┐       │    │
     ╲    │                          │                  │───────┘    │
      ╲   ▼                          │   INAs enter     │            │
  ┌──────────────────┐               │   negotiation    │────────────┘
  │                  │──────────────►│   session(s)     │
  │   INA access     │       ┌──────►│                  │
  │  Auction Module  │       │       └──────────────────┘
  │                  │       │              │
  └──────────────────┘       │              │         3167
                             │No            ▼       ╱
                      ┌──────────────────────────────────┐
                      │ Finish transaction after         │
                      │ deal is struck between           │
                      │ B-INA & S-INA                    │
                      └──────────────────────────────────┘
                        ┌───────────────┐      │
                        │  ITAs close   │◄─────┘
                        │  transaction  │
  3175                  └───────────────┘   3170
     ╲         Yes        ╱
  ┌──────────────────┐◄──
  │ Close transaction│
  └──────────────────┘
```

Fig. 32: INA Architecture 1 (First part interactions)

Corporate database 3205
Corporate database 3210
Corporate database 3215

3220 Seller Inter-Agent1
3235 S-AA
3225 Seller Inter-Agent2
3230 S-AA 3240
Seller Inter-Agent3

3245 Showcase 1
3250 Showcase 2
3255 Showcase 3

3265 Promotions RMO's
Promotions RMO's 3260
Promotions RMO's 3275

3270 CSA

3280 Initial search request

3282 Display results

3285 Buyer INA
3290 B-AA

3295 Seller INA-1
3300 Pre-negotiation session
3305 Seller INA-3

3310 Negotiation session
3315 Select winner & award contract
3320 Complete transaction
3325 Disable Agent

Fig. 33: INA Architecture 2 (Negotiation interactions)

Seller INA1 — 3405
S-AA — 3410
Seller INA2 — 3415
Buyer INA — 3420
B-AA — 3423
Seller INA3 — 3425
S-AA — 3430

Pre-negotiation session — 3435

All INAs Negotiation session 1 with several INAs — 3440

B-INA & SINA1 & B-INA & SINA3 session 2 — 3443

B-INA & S-INA3 Negotiation session 3 — 3445

Select winner & award contract — 3450

B-ITA — 3455
S-ITA — 3460

Re-negotiate

Complete Transaction — 3465

Close session — 3470

Fig. 34: INANegotiation Time Based Sequences

Buyer   Seller

3505
[1st Search request]

3510
[Seller 1st ask]

3515
[1st buyer offer]

3520
[1st Seller counter offer]

3525
[2nd buyer counter offer]

3530
[2nd Seller counter offer]

3535
[Buyer accepts]

Fig. 35: Initial INA Mobile Location Protocol Settlement

3555

Buyer
INA

3560

Seller
INA1

3565

Seller
INA2

3570

Pre-negotiation: Initial
session(s) to
determine sellers and
buyer locations
at which to negotiate

3575

Negotiate at buyer
INAlocation

Alternating Locations

3580

Negotiate at one or
more Seller
INAlocations
simultaneously

Fig. 36: Tournament Configuration of INA Winner Determination

3605

S-INA -1

3610

S-INA -2

3615

S-INA -3

3620

S-INA -3

Phase I
Need to select
two from field
of at least four

3625

Buyer INA

3630

S-INA -2

3635

S-INA -4

Phase II
Selection of
two finalists

3640

Buyer INA

Phase III
Selection of
winner

3645

S-INA -4

Fig. 37: Multivariate Negotiation

[Asks, bids and offers based on variables beyond price alone]

1st CSA search request 3705

3710

3715

1st ask by Seller INA-1

1st ask by Seller INA-2

3725

3720

Seller AA checks buyer's sales history

3730

Buyer INA1st counter-bid* to each S-INA

Seller AA checks buyer's credit & accountability

3740

S-INA -1 1st counter offer

3735

S-INA -2 1st counter offer

3750

Need more negotiation to complete transaction

3745

Buyer INA2nd counter-bid to SINA-1

Buyer INA2nd counter-bid to SINA-2

3754

3756

3752

S-INA -1 2nd counter offer

no

Terminate

no

S-INA -2 2nd counter offer

yes

3762

3760

B-ITA

Buyer INA accepts S-INA -2 offer

Need more negotiation to complete transaction

* Counter-bids and counter offers can be based on item, quality, features, terms & other factors beyond price.

To Complete Transaction

3764

S-ITA2

3768

Terminate session

Close Transaction

3766

Fig. 38: Demand-Initiated Automated Negotiation Sequence Compromise Process Within Pre-established Parameters between One Buyer & One Seller

Variable 1

Buyer

Seller

3772

(2) $50

3770

$100 (1)

3776

(4) $60

3774

$90 (3)

3780

(6) $70

3778

$80 (5)

3784

(8) $72

3782

$75 (7)

3786

[Final]------> $73.50 (9)

Variable 2

Buyer

Seller

3792

(2) 2 options & 6% interest

3790

6 options & 12% interest (1)

3796

(4) 2 options & 8% interest

3794

6 options & 10% interest (3)

3800

(6) 3 options & 8% interest

3798

4 options & 10% interest (5)

3804

(8) 3 options & 9% interest

3802

4 options & 9% interest (7)

3806

[Final]------>   3 options & 9% interest (9)

Yes /Renegotiate\ No
     \other terms?/

3808

Close

3810

Fig. 39A: Negotiation in a Distributed System with Mobility

3820 — B-INA initiates negotiation session with S-INA

3822 — INAs identify location possibilities at which to negotiate

3825 — INAs specify agreed location at which to negotiate

3827 — B-INA moves to S-INA location with program code

3830 — At the S-INA location, the S-INA identifies incoming B-INA entry after activation & approving security protocol

3832 — Agents engage in negotiation task

3835 — Agents complete negotiation task

3840 — B-INA notifies its "home" computer by sending message of activities at remote location

3845 — B-INA executes more tasks at remote location? → No → Terminate or return home   3850

Home

Terminate

Yes

3855 — B-INA assesses next task using internal database and analysis

3857 — B-INA assesses next location for task

3860 — B-INA identifies next location for task

Fig. 39B: Negotiation in a Distributed System with Mobility (Continued)

3865 — B-INA moves to another location

3870 — Wait for agent to move its program code

3875 — B-INA identifies need for AI computation

3880 — B-INA requests AI computation resources at specified location

3885 — B-INA identifies AI computation resources available

3890 — B-INA messages to remote location request for AI computation & specifies computation resources sent to specific location

3895 — B-INA receives AI at specific negotiation site

3900 — B-INA tests sufficient AI computation resources at remote location

3905 — Complete negotiations at remote location

3910 — Agent returns home

Fig. 40: Multi-lateral Distributed Competition
(Competitive Double Shout Negotiation)

Fig. 41: Negotiation Module: Negotiation Method Schema

1 to 1 Interactive Negotiations

Kinds Of Goals

Short Term goal
(price -
maximization)

-vs-

Long-term
goal
(relationship
management)

Constraining Factors

1) Time con-
strained: multi-ses-
sions as instrumen-
tal changes

2) Information
constrained: less
than optimum infor-
mation

3) Choice
Constrained:
Limiting of options

Terms

1) Item terms
2) Transaction
terms

Cooperative Goals (Zero-Sum Game)

1) Exchange-based approach:
Trade-off of terms/variables
between parties
a) matching of interests: ascer-
tain mutual interest with overlap-
ping sets...
b) prioirtizations of preferences:
hierarchy of similar priorities

2) Problem-solving approach:
parties seek a common solution
a) assessing common interests
among different positions
b) compromise of positions to a
common set shared by parties

Buyer-Initiated

[Negotiation as adjustment of
seller parameters]
a) buyer query as initiation
b) priority of best and then sec-
ond best, and then third best,
etc...

Competitive Goals (Zero-Sum Game)

1) dialectical approach: give &
take of opponents until resolution
a) [position description & justifi-
cation] explanation based: each
position advances and develops
b) [Interrogation] argumentation:
critique of opponent's position*
c) [Ascertain mutual self-interest]
Assessing overlapping interests
d) Selecting common sets

*Anticipate opponent's strategy

Non-Zero-Sum Game

1) deterrence approach: behav-
ing so that competitors do not
get without higher cost
a) bidding aggressively and/or
deceptively and then withdrawing

Seller initiated

[Negotiation as disagreement
with initial seller promotions]
a) promotions or 1st seller bid
(result of search query) as 1st
point of departure

Multiple Parallel Interactive Negotiations

One to several
a) Stopping negotiation when
one winner is selected

Several to several
Single Item: Stopping negotia-
tion when one buyer & 1 seller
is selected
Multiple items: a) Stopping
negotiation when mutual agree-
ment of multiple parties

Fig. 42: INA Auction Module-Auction Types

Auction Types

English (Increasing)	Dutch (Decreasing)
Vickrey (second highest bid)	"combinatorial" multiple-item auctions (package deals)
Combinations of auction types	Double-shout

Fig. 43: Negotiation, Pricing & Auction Module Interactions

4105

4110

Auction Module

Pricing Strategies Module

4112

4117

4115

B-AA

Negotiation Module

S-AA

4120

AI

4112

4125

4117

INA Sessions 1

INA Sessions 2

INA Sessions 3
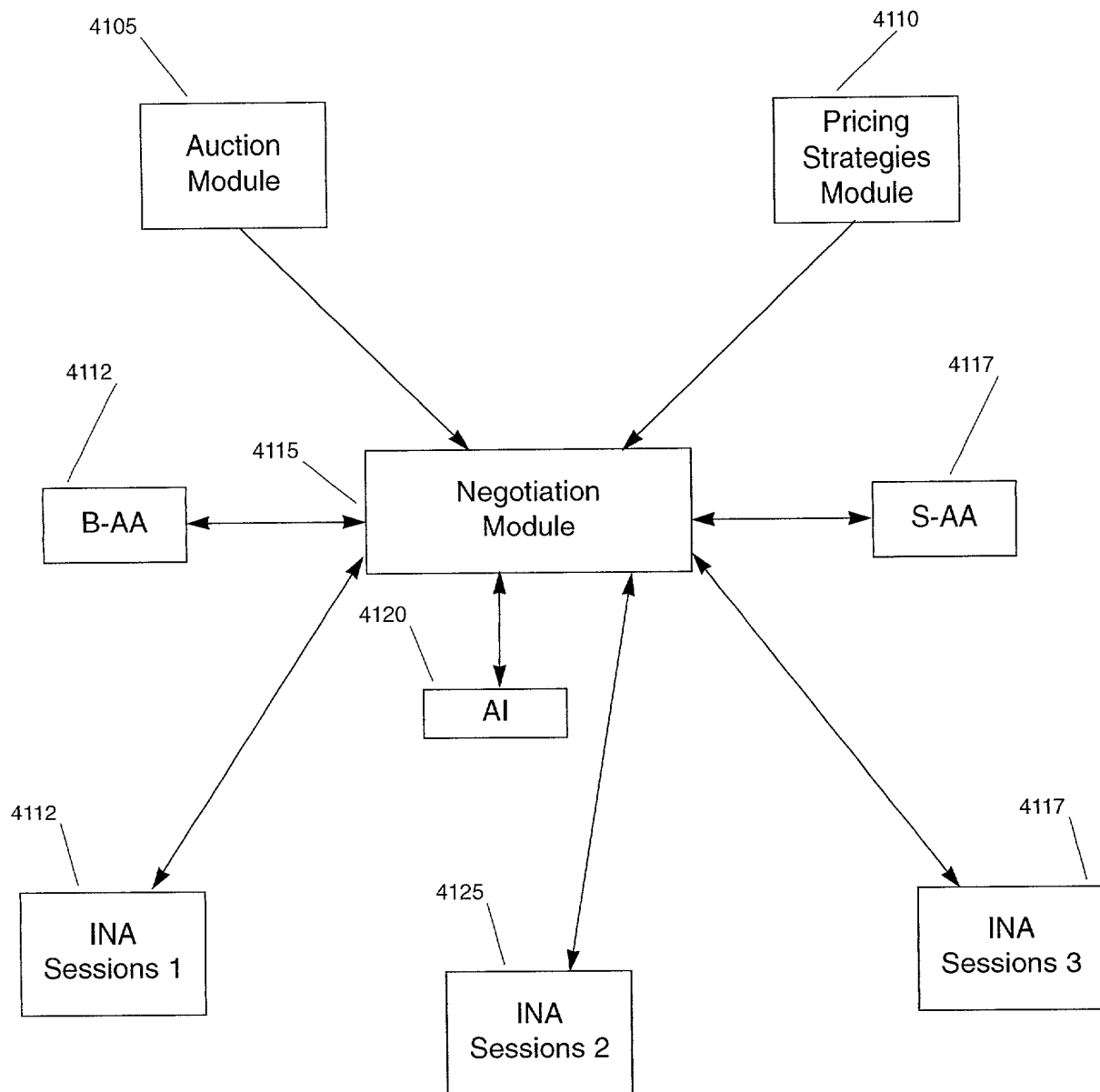
Fig. 44: Pricing Strategies Module and AA Interactions
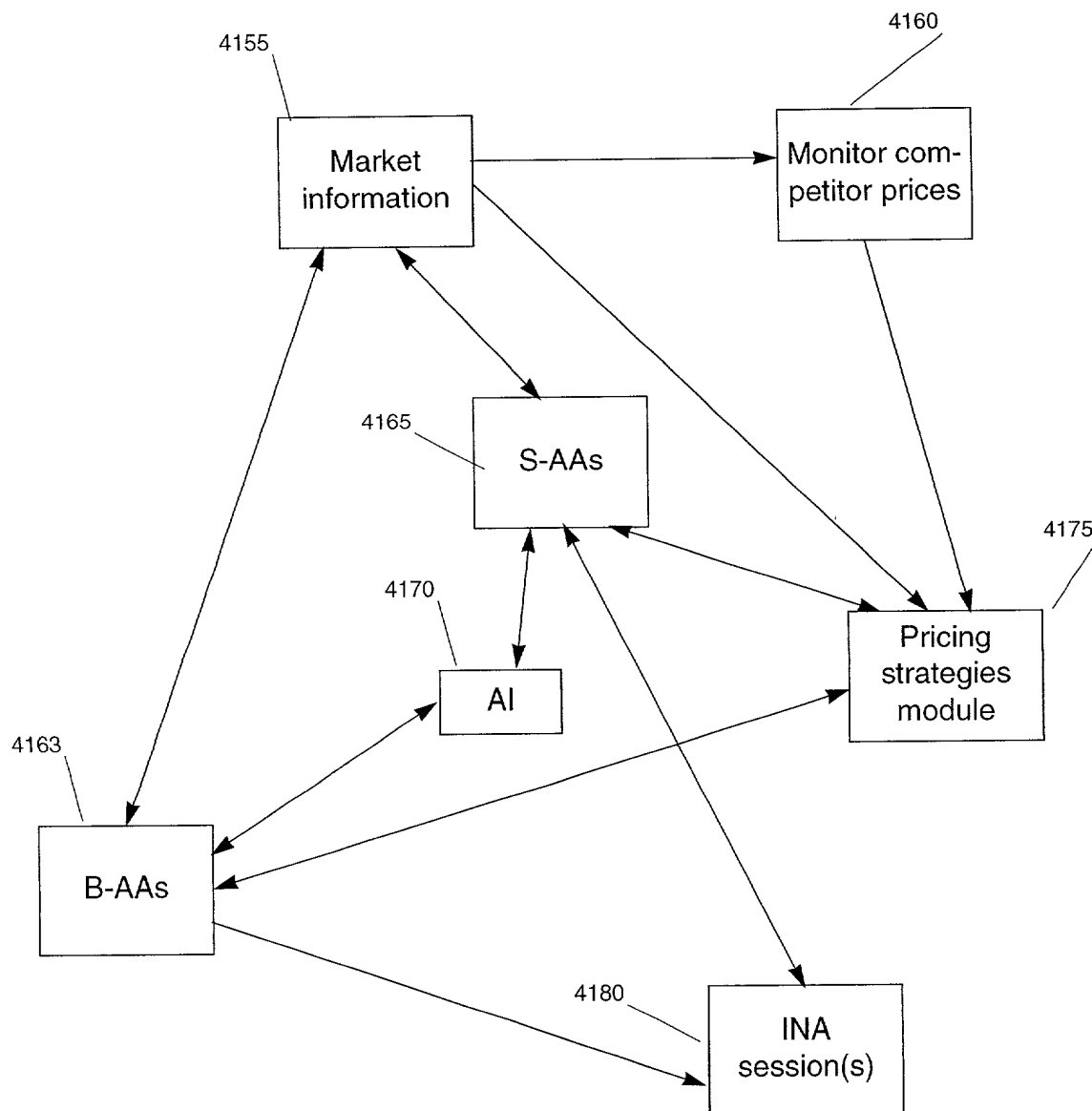
Fig. 45: Interaction Dynamics of INA "Personalities"

Yield Management	-Seller surpluses -Buyer shortages		-Seller shortages -Buyer surpluses
INA Stance	Optimistic		Pessimistic
INA Stance	Opportunistic (exploit)	neutral	Conservative (wait)
INA Stance	Aggressive (rush)	neutral	Unaggressive (delay)
Combination of INA Stance		Alternating between various "Attitudes" primarily to disguise INA Stance(s)	

Fig. 46: Neutral Broker Agency
C-INA Intermediation & Aggregation Applications

4505

Showcase 1

4510

Showcase 2

4515

Showcase 3

4520

Commercial Search Agent
(CSA)

4525

S-INA -1

S-INA -2

S-INA -3

S-INA -4

Specific Items
picked out for
aggregation

4530

Neutral C-INA
3rd-party
intermediary

4535

B-C-INA -
1

B-C-INA -
2

B-C-INA -
3

Possible
aggregating
of buyers

4540

Intelligent Transaction Agents (ITAs)
fulfill B-INA baskets at specified
time intervals

Fig. 47: C-INA Transaction Initiation Sources

Buyer side

Seller Side

4555

Buyer request promotions

4557

Lead buyer broadcasts seller promotions to buyers with similar interests

4560

Track customers' interests and provide promotions

4565

Track customers' interests and provide promotions

4570

Proximity Marketing: Customer (space/time) Situation Stimulates Contextual promotions

4575

Sellers notify buyers of promotions

4580

Sellers provide buyers initial invitations

4585

Sellers push targeted ads

4590

Buyer INAs are notified of seller opportunities

Fig. 48: B-C-INA Aggregation

Seller triggers
buyer co-operation
by initiating negoti-
ation process with
several buyers
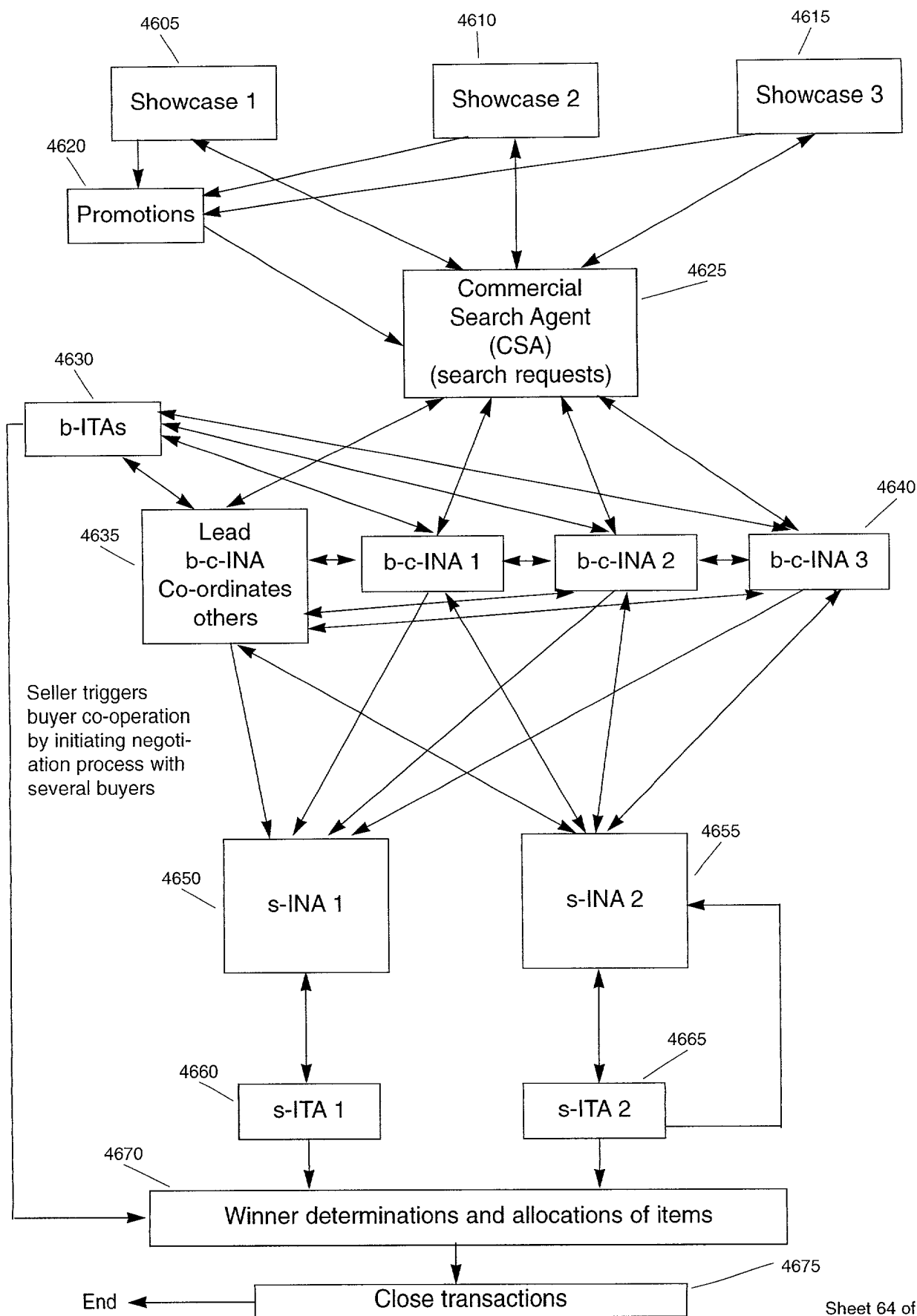
Fig. 49: Automated Aggregation Category Structures

Combinatorial Auctions for multiple item bundles from various sellers — 4705

4740 — **Buyer Clubs** Voluntary discount clubs

4745 — **Buyer Alliances** Self organizing systems shifting with buyers and project changes

4710

pre-set bundles

open bundles

4720 — S-INA -1

4750 — **Mass Pooling** Grouping similar interests

4725

pre-set bundles

open bundles

S-INA -2

4755 — **Clustering Agent Pools** Specialized interests grouped for specific projects

4730

pre-set bundles

open bundles

S-INA -3

4760 — **Cooperating Buyers** Self-selected groups cooperate on specific projects

4765 — **Specialized Vertical Coalitions** Specialized buyer discounts for changing projects

4770 — **Mass-customization** Buyers acquire unique items

Fig. 50: Aggregation I – Mass Pooling

4805 C-INA B1

4810 C-INA B2

4815 C-INA B3

4820 C-INA Bn

4825 Time sensitive order distribution

4830 Time T1 | Time T2 | Buyers items pool by time deadlines for wholesale discount | Time Tm-1 | Time Tm

4835 Item sensitive bid distribution at various locations

4840 B-ITAs

4845 INA S1 Item 1

4850 INA S2 Item 2

4855 INA S3 Item 3

4860 INA Sp Item p

4865 B-ITAs

4870 Final orders are distributed to buyers

4875 Close session once quorum is met

Fig. 51: Aggregation II–Disintermediated Aggregation Method Prior To Negotiation
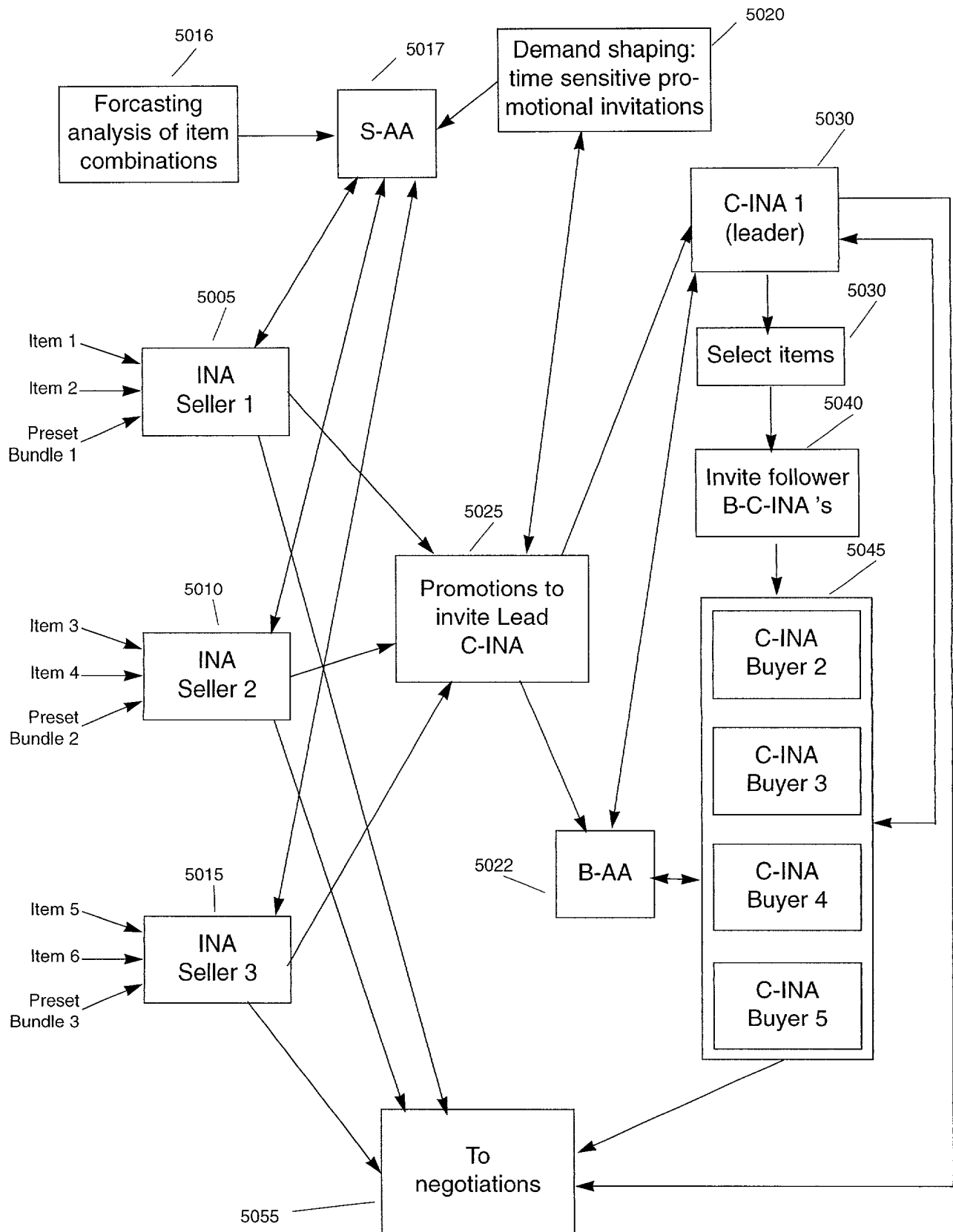
Fig. 52: Aggregation III –
Disintermediated Mass Customization

Item 1
Item 2
Preset
Bundle 1

5105

S-INA
Seller 1

5130

B-C-INA
Buyer 1

Item 1
w/features
2 & 3

Item 1

Item 3
Item 4
Preset
Bundle 2

5110

S-INA
Seller 2

5135

B-C-INA
Buyer 2

Item 1
w/features
1 & 4, &
Item 4
w/features
2 & 3

Item 4

5140

B-C-INA
Buyer 3

Item 1
w/features
1 & 4,
Item 4
w/features
2 & 3 &
Bundle 3

Item 5
Item 6
Preset
Bundle 3

5115

S-INA
Seller 3

Bundle 3

5145

B-C-INA
Buyer 4

Bundle 3

Item 7
Item 8
Preset
Bundle 4

5120

S-INA
Seller 4

Fig. 53: Dynamic D-INA 's Double-agents: Arbitrage Applications

Phase I

5240

Seller
INA1

5260

Dynamic INA
(Buyer role/model)

5250

Negotiation
sessions

Seller
INA2

5255

5270

5265

D-INA
Switches Roles
from buyer to seller

Close transactions &
receive (rights to)
item from S-INA 2

Phase II

5275

Dynamic
INA
(Seller role/model)

S-INA

5278

5280

Need more
contingencies
to close
transaction

Buyer
INA chooses
the D-INA item

Don't buy it

5285

Abandon
transaction

5290

Buy it

5295

B-ITA

Drop-ship item to B-
INA from first S-INA 2

5300

Close transaction

Fig. 54: Traditional Combinatorial Auction with Intermediary: Between Single Seller and Multiple Buyers

Single bid phase
Auction process

Buyers

Items: 1 - 5

5510

5515

5505

5520

One Seller

5525

5530

1

2

3

4

5

5535

Intermediary

5540   5545

B-INA 1   2 & 4 = X

5550   5555

B-INA 2   1, 2 & 3 = Y

5560   5565

B-INA 3   1, 3 & 4 = Z

5570   5575

B-INA 4   1 & 2 = R

5580   5585

B-INA 5   2, 3 & 5 = N

5590   5595

B-INA 6   3 = T
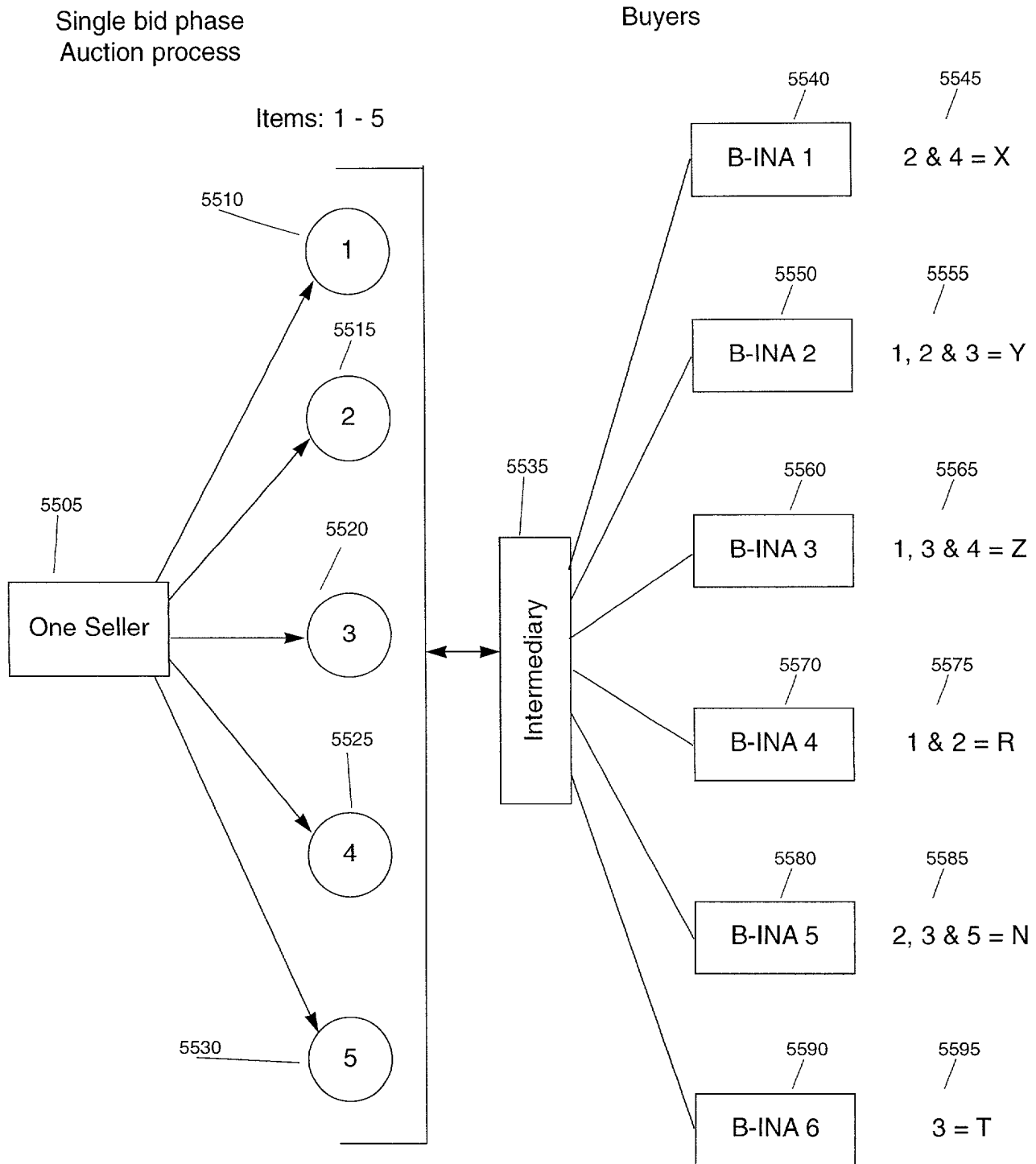
Fig. 55: INA Combinatorial [Double] Auction between Single Seller with Multiple Items and Multiple Buyers

5655

Buyer-INA B

5660

1   2

5670

Buyer-INA A

5675

Buyer-INA C

3   4

5680

Buyer-INA D

5685

A = 1 & 3
B = 1 & 2
C = 2 & 4
D = 2, 3 & 4

Fig. 56: Final Session
Winner Determination of Interactive Multi-lateral Auction

5705

5715

Seller 1 -- Buyer

Dutch Auction
Descending Price

English Auction
(Ascending Price)

5725

Reverse
Auction

Multilateral
Double Opposing
"Shout" Auction

(With Intermediary
or
Without Intermediaries)

Descending Price
Dutch Auction

5735

Seller 2

Fig. 57: Factor Filters

5805 — S-INA or B-INA

↓

5810 — Evaluation of multiple bidders

↓

5815 — Factor filters (pruning techniques)

↓

5820 — Priority Preference specified

- Preset bundles — 5825
  - Threshold Factor-Specific item that is critical to bundle — 5855
- Specific bundles — 5830
  - Item Preferences Seek preferred item in bundle — 5890
  - Need specific (complementary) item(s) to make the whole bundle valuable to the buyers — 5900
- Progressive bundles — 5835
  - Successor Contingent bundles — 5860
    - Seek 1st choice, then 2nd choice, then 3rd choice, etc. when avail. — 5875
  - Priority Contingent bundles — 5865
    - Seek first item & only then second item, etc. — 5880
- Quantity bundles — 5840
  - Increased chances of availability of multiple substitutable items — 5895
  - Award 2+ quantity to 2+ buyers — 5905
- Quality bundles — 5845
  - Best overall items are sought — 5867
  - Best value for less quality — 5883
- Temporal Adaptive bundles — 5850
  - Contingent on dynamic prices across product/service cycle — 5870
  - Value fluctuation determines item priority in scope of time — 5885

Fig. 58: Disintermediated Multi-item Bidding From One Seller To Multiple Buyers

5955 → B-AA
5960 → B-AA
5965 → B-AA
5970 → B-AA

5975 → B-INA 1
5980 → B-INA 2
5985 → B-INA 3
5990 → B-INA 4

[Pre-negotiated proto-
cols determine location
of bids & winner deter-
mination rules]

5995 — Mutually agreed rules
of negotiation

[Bids on varying sets of
items within established
time phase]

6000 — Seller INA- Multiple items

6005 — Factor filters

6007 — Buyers select unique sets of specific items

6010 — Long-term relation-
ship management

6015 — Evaluation of
bids by seller

6020 — Short-term revenue
maximization

6025 — 2 winners selected by
more than price fac-
tors alone

6030 — Winner 1

[Multiple items
can be split
between 2+
bidders]

6035 — Winner 2

6040 — Highest two overall
bids selected

Second
phase of
bids

6045 — Evaluation of second phase of bids

6050 — Highest "overall" bid on multiple items

6055 — Winner determination by S-INA

6057 — ITAs

6060 — End

Fig. 59: Disintermediated Multi-item Bidding between Multiple Sellers and Single Buyer

6105 — B-AA

6110 — B-INA

6113 — CSA initial search for bundles of items

6115 — Mutually agreed rules of negotiation

6120 — S-INA 1

6125 — S-INA 2

6130 — S-INA 3

6135 — S-INA 4

Bidding by sellers for buyer's bundle — 6140

6155 — Pruning techniques of open bundles

[Limited bundles (increase efficiency)

6170 — Factor filters

6180

6165 — Long-term relationship management[more than price alone]

6175 — Evaluation of bids by buyer

Short-term revenue maximization: highest price for each item

[Narrow to 2 sellers]

6185 — S-INA 2

S-INA 4 — 6190

6195 — Prioritization of bids by B-INA

6200 — End

6205 — B-ITA

S-INA 2 — 6210

Winner determination

Fig. 60: Disintermediated Aggregation of Pre-Set Bundles between Multiple Sellers & Multiple Buyers

6260

6255

Preset
Bundle 1
Product 1
Product 2
Service 1

Seller
INA1

6265

Buyer
C-INA 1

6275

6270

Preset
Bundle 2
Product 3
Product 4
Service 2

Seller
INA2

6280

Buyer
C-INA 2

6295

Buyer
C-INA 3

6290

6285

Preset
Bundle 3
Product 5
Product 6
Service 3

Seller
INA3

6300

Buyer
C-INA 4

Fig. 61: Disintermediated Multi-item Bidding Between Multiple Sellers & Multiple Buyers

1 – 4:	Seller I	
5 – 8:	Seller II	
9 – 12:	Seller III	

Buyer Bidder A:	1, 5, 9
Buyer Bidder B:	2, 3, 4, 6, 7, 8
Buyer Bidder C:	3, 4, 7, 8, 12
Buyer Bidder D:	5, 6, 7, 9, 10, 11
Buyer Bidder E:	9, 10, 11, 12

Fig. 62A: Disintermediated Aggregation Of Multiple-item Bundles Bidding From Multiple Sellers To Multiple Buyers using C-INA 's

Phase I

6405 — S-AAs

6410 — B-AAs

[B-C-INA 's congregate at various locations at request of the lead B-C-INA . Pre-auction phase to set initial rule, once quorum of B-C-INA 's are congregated]

6415 — 6420 — Seller C-INA 1

6430 — B-C-INA 1: Seek set A

[Lead B-C-INA]

6435 — 6440 — Seller C-INA 2

6450 — B-C-INA 2: Seek set B

6445 — Cooperation of S-C-INA 's in order to calculate B-INA bid values

6455 — 6460 — Seller C-INA 3

6465 — B-C-INA 3: Seek set C

6480 — Winning Bid(s) selected by seller calculations of high bid on multiple items

6470 — 6475 — Seller C-INA 4

6485 — B-C-INA 4: Seek set D

6490 — Winning Bid(s) has priority for substitute items among winning seller(s)

Fig. 62B: Disintermediated Aggregation Of Multiple-item Bundles Bidding From Multiple Sellers To Multiple Buyers using C-INA 's (continued)

6505

Seller
C-INA 1

6520

Seller
C-INA 2

6525

Seller
C-INA 2

6540

Seller
C-INA 3

6560

Seller
C-INA 4

6545

Seller
C-INA 4

6550

Seller
C-INA 2

6510

Pooling of inter-
ests for multiple
item bundles
among buyers

6530

Bids are made &
evaluated cooper-
atively or competi-
tively: Buyers can
divide items
among them-
selves if coopera-
tively

6455

Buyers assem-
bling specific
packages that are
matched with sell-
er sub-sets of
items

6575

Bids on specific
sub-sets of items
in later phases
among buyers

6515

Buyer
C-INA 1

6535

Buyer
C-INA 2

6550

Buyer
C-INA 3

6570

Buyer
C-INA 4

Phase I

Phase II

Phase III
Winning
seller

Final
phases

Fig. 63: Disintermediated Arbitrage Of Multi-item Bundles Between Multiple Sellers & Multiple Buyers using D-INA 's
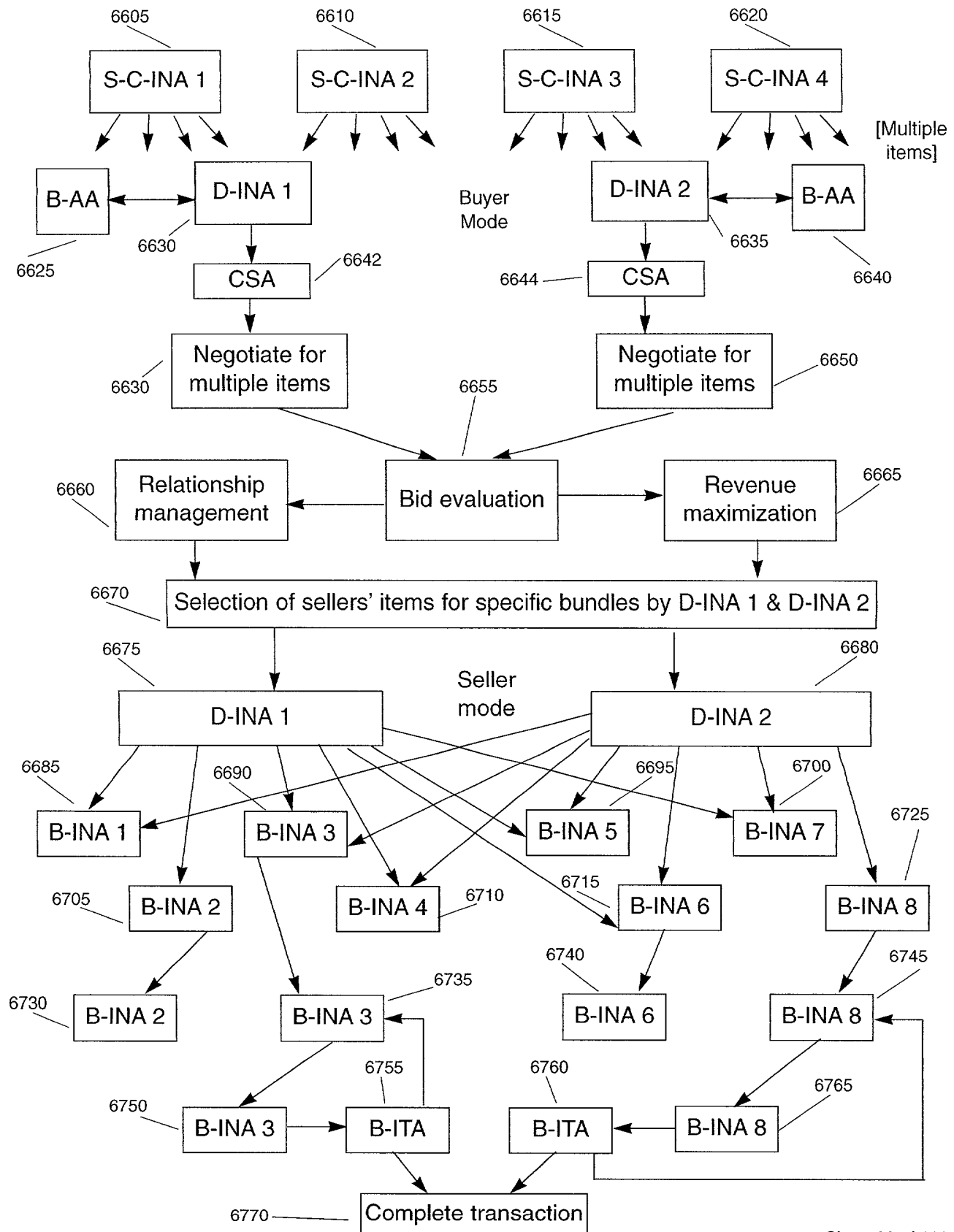
Fig. 64: Multifactorial Bidding Approaches
Sorting By Item Variables

Quality

Attribute – color, style, etc.

Quantity

Availability (now or later)

Delivery Time & Terms

Size

Dynamic Pricing Across product/service cycle

Brand/manufacturer

Configuration

Features

Additional options

Combinations of various features

Price

Payment Method

Payment Terms

Location

Fig. 65: Example of Multiple Feature Factors: Personal Computer Configurations

Manu.	CPU/ Mother board	Brand	OS	RAM	HDD	Modem & ISP contract.	DVD	Monitor	Price
Intel	500-ABC	IBM	MS	64	10	56 kbs	DVD	15 in	
Intel	500-ABC	Dell	MS	128	10	56 kbs	DVD	17 in	
AMD	500-XYZ	Gateway	MS	128	20	56/ISP	DVD	19 in	
AMD	800-XYZ	HP	MS	128	0	56/ISP	DVD	17 in	
AMD	800-ABC	IBM	MS	256	20	56/ISP	DVD	17 in	
AMD	800-ABC	Dell	Linux	256	20	128	DVD-RAM	17 in	
Intel	800-ABC	Gateway	Linux	256	30	128	DVD-RAM	17 in	
Intel	800-ABC	HP	Linux	256	30	128	DVD-RAM	17 in	
Intel	1.2-XYZ	IMB	Linux	256	30	128/ISP	DVD-RAM	17 in	
Intel	1.2XYZ	Dell	Linux	256	40	128/ISP	DVD-RAM	17 in	
Intel	1.2-ABC	Gateway	MS	256	40	128/ISP	DVD-RAM	19 in	
Intel	1.2-ABC	HP	MS	256	40	256	DVD-RAM	19 in	
AMD	1.2-ABC	IBM	MS	256	40	256	DVD-RAM	19 in	
AMD	1.2-ABC	Dell	MS	512	60	256	DVD	19 in	
AMD	1.2-XYZ	Gateway	MS	512	60	256/ISP	DVD	19 in	
AMD	1.8-XYZ	HP	MS	256	60	256/ISP	DVD	19 in	
AMD	1.8-XYZ	IBM	Linux	256	60	1.2mbs	DVD-RAM	21 in	
Intel	1.8-XYZ	Dell	Linux	256	80	1.2mbs	DVD-RAM	21 in	
Intel	1.8-XYZ	Gateway	Linux	512	80	1.2mbs	DVD-RAM	21 in	
Intel	2.4-ABC	HP	Linux	512	80	1.2/ISP	DVD-RAM	21 in	
Intel	2.4-ABC	Sony	MS	512	120	1.2/ISP	DVD	21 in	
AMD	2.4-ABC	Sony	MS	1.2	120	1.2/ISP	DVD	21 in	

Quantity – Discounts – 2-5, 5-9, 11-19, 21-29, 30-99, 100-499, 500-1999, etc.

Fig. 66: Examples of Categories of Multi-item Bundles

1. Computer Hardware configurations – RAM, HDD, CPU, monitor

2. Computer Hardware& Software

3. Computer Hardware & Services

4. Office equipment computer, printer, copier, fax, phone

5. Telephone equipment & services – local and long distance

6. Telecom capacity – rev. maximization across demand cycle

7. Electronic equipment – A/V combinations & software accessories

8. Photo equipment – camera, lenses, accessories, film, digital media

9. Airline tickets – time constraints to sell multiple seats to maximize revenue

10. Machines, machine parts, machine accessories

11. Cars/trucks & accessories

12. Wardrobe combinations, pants, shirts, coats

13. Real Estate – contiguous properties

14. Communications spectrum – contiguous properties

15. Gems

16. Railroad & trucking scheduling

17. Art, antiques, rugs, etc.

18. Housing combinations

19. Intellectual Property combinations

20. Pharmaceuticals

21. Chemicals

Fig. 67: S-ITA System Architecture

Market Data   6800

S-INA   6805

S-AA   6810

Various Services
(at different
locations)

Credit Status

6815

Accountability

Insurance

S-ITA

Warranty

(seller location)

Computation
resources

Financing

6820

6830

Close Transaction
(Seller or Buyer location)

Fig. 68: S-ITA Operation

```
          ┌─────────────────────────┐
          │         S-INA           │  6850
          │ provisionally completes │
          │      negotiation        │
          └─────────────────────────┘
                       │
                       ▼
          ┌─────────────────────────┐
          │         S-INA           │  6855
          │  requests S-ITA to clear│
          │      transaction        │
          └─────────────────────────┘
                       │
                       ▼
          ┌─────────────────────────┐
          │         S-ITA           │  6860
          │ initiates review of     │
          │ transac-tion terms and  │
          │ item terms              │
          └─────────────────────────┘
                       │
                       ▼
          ┌─────────────────────────┐
          │ S-ITA  accesses financial│  6865
          │ data-base to check      │
          │ buyer's credit          │
          └─────────────────────────┘
                       │
                       ▼
6885                                  6870
┌──────────────┐   No  ┌─────────────┐
│ Buyer's credit│◄─────│    S-ITA    │
│ not approved │       │ clears buyer's│
│              │       │   credit?   │
└──────────────┘       └─────────────┘
       │                      │ Yes
6890   │                      ▼
       ▼              ┌─────────────┐  6875
┌──────────────┐      │ Aprove credit│
│ Send back to │      └─────────────┘
│ negotiation  │             │
│ session(s)   │             ▼
└──────────────┘      ┌─────────────┐  6880
                      │Close transaction│
                      └─────────────┘
```

Fig. 69: S-ITA and B-ITA System Process in Final Negotiation with One Seller

S-ITA
Seller Location

B-ITA
Buyer Location

Showcase — 6905

Pre-Negotiation Session(s) — 6910

CSA — 6915

S-AA — 6920

Seller INA — 6925

Buyer INA — 6930

Negotiation Session(s) — 6935

S-ITA — 6940

B-ITA — 6945

B-AA — 6950

Close Transaction — 6955

End Run — 6960
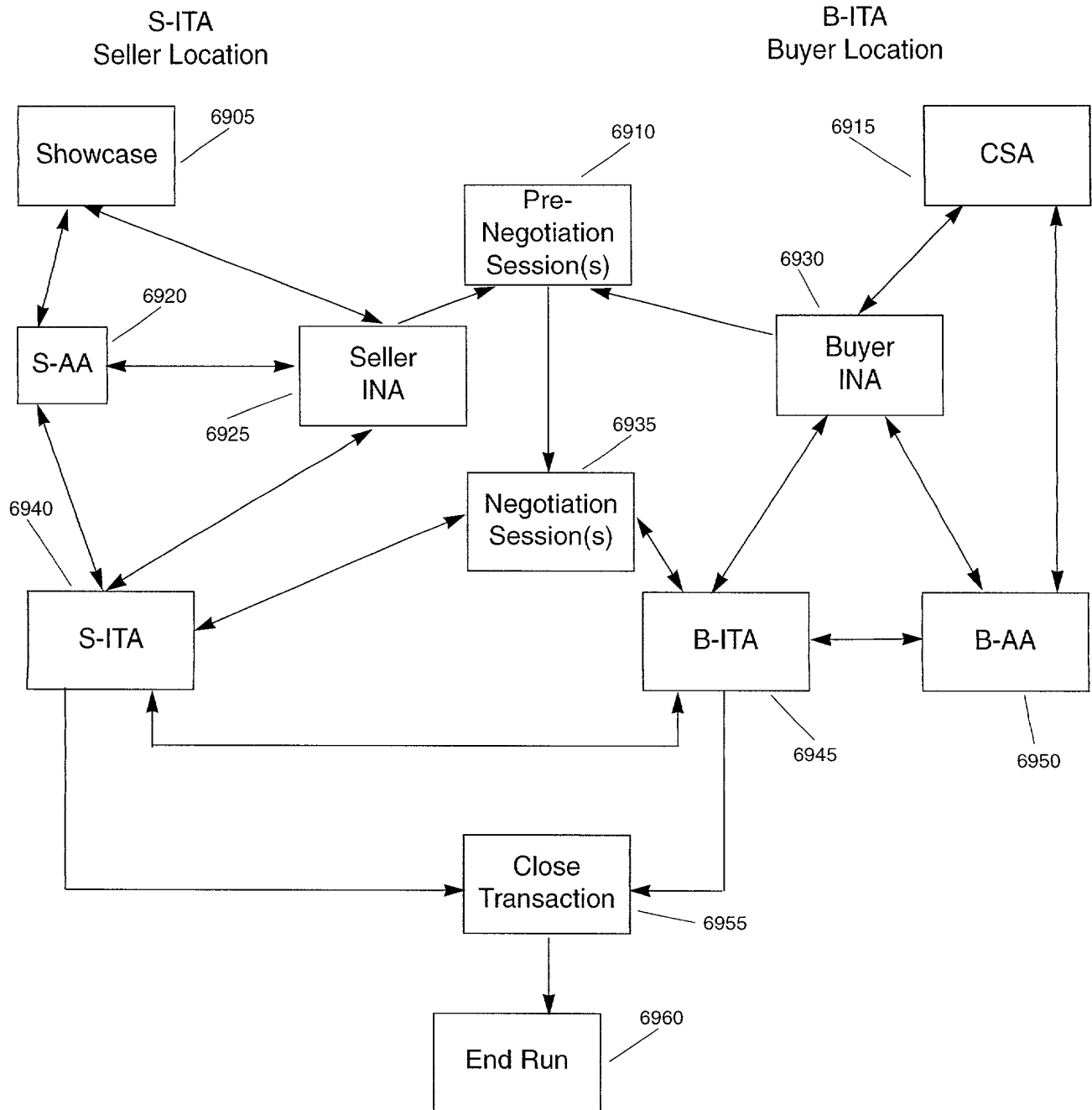
Fig. 70: ITA Service Categories: Buyer & Seller Roles

s – ITA Services	b – ITA Services	dual – ITA Services

s – ITA Services

Info.

AA functions

Superscore

Accountability

Credit info.

Services
Compliance – legal

Compliance – tax

RMO's

finance/credit

payment processing

Fulfillment –
    shipping/tracking

due diligence

escrow

report generator

post-sale feedback

b – ITA Services

Info.

AA functions

Info about market, companies.,

economy, industry,

products, etc.

Services

Promotion discounts

Warranty

Insurance

dual – ITA Services

Info.

Services
Compliance – legal

Compliance – tax

RMO's

finance/credit

payment processing

Fulfillment –
    shipping/tracking

due diligence

escrow

report generator

post-sale feedback

Fig. 71: ITA Services

Accountability index →
→ prior experience online
→ credit score & credit check

Financial credit module
— matching buyer with appropriate lender

Contracting module

Compliance module
Legal compliance
Federal/state/international rules

Tax compliance

International customs compliance

Risk management options

Payment processing module
— method of payments
— billing/invoice
— financial clearing and account crediting

Shipping/ delivery terms/tracking

Warranty Info & conditions

Insurance risks

Bookkeeping & accounting function

Due diligence

Escrow process

Report generator

Accelerated processing for high rated customer
Post sale feedback

Fig. 72: B-INA Micro-agents with Mobility

7105 — B-INA Meta-agent

7110 — B-INA Micro-agent 1 launched for specific negotiation session at S-INA -1 location

7115 — B-INA Micro-agent 2 launched for specific negotiation session at S-INA -2 location

7120 — B-INA Micro-agent 3 launched for specific negotiation session at S-INA -3 location

Negotiation session at remote location 7125

7130 — Negotiation session at remote location

7135 — Negotiation session at remote location

B-INA at buyer home or remote location 7145

Winner determination at buyer home 7150

7155 — Mutual agreement: S-INA3 & B-INA

7160 — Close sessions for S-INA1 & S-INA2

7165 — S-ITA3 complete deal? no

yes

7170 — End session

Fig. 73: Genetic Algorithms Applied to Multi-Agent System

7205
Start

7210
Market Data Inputs in distributed system

7215
Search for optimal solution

7220
Pattern matching → no → 7223 **end**

7225
Generate set of candidate solutions based on available information

7228
Randomized mutation engine

yes

7230
Match candidate solutions with market data

7235
Create new generations of candidate solutions based on multi-factorial mutations

Breed new generation of candidate solutions

7240
Produce candidate variants using operators on surviving candidates

7245
Evaluate candidate solutions according to efficiency criteria

Discard
7250

7255
Decide which candidate solutions will be kept or discarded by testing

7260
Winner determination by using most updated criterion

7270
Solution results

7265
Sub-optimal solutions within specified constraints & trade-offs

7280
Ranking of each generation of candidate solutions for fitness

7275
Optimal solution relative to all candidates available

7285
Apply algorithm to agent analysis or activity

7290
End Run

Fig. 74: Neural Networks Applied to Multi-Agent System

Market data inputs in distributed system — 7305

Start — 7310

Initial solution based on available information — 7315

FL inputs — 7320

Generate NN's — 7325

Comparison of optimal statistical scenarios

Compare

Train NN's for fitness using training patterns — 7335

7330

(parallel computations for maximum efficiency)

Mutation engine — 7345

Pattern matching for optimal fitness — 7340

Random — 7355

Alternating Sequence — 7360

Pruning of candidate NN's — 7350

Retrain non-optimal NN

Testing run — 7365

Ranking each generation for fitness — 7370

Stable equilibrium point — 7372

Time constraints limit number of NN training generations

Replace less fit NN with expanded trained NN's — 7375

Apply select NN to agent analysis or activity — 7380

End Run — 7385

Fig. 75: Genetic Programming System Process

Data Inputs — 7505

7510 — Rule Based Learning

Regression Analysis — 7515

Induction Decision Trees — 7520

7525 — Pruning by matching what works

Organizing Models — 7530
-Scope
- Accuracy
- Missing values, Exceptions & Errors

7535 — Heuristic operational rules

7545 — Relearning

Scenarios — 7550

Forecasts — 7555

7560 — Yes %

No % — 7565

7570 — Apply to agent analysis or activity

7575 — End run

Fig. 76: Genetic Programming Learning Schemas

Predictors

Majority predictor   Average predictor

(Naive) Bayesian Inference

Decision Table

Machine Learning Methods

Decision Trees

Regression Methods

Goal Based Learning

Instance Based Learning

Rule Based Learning

Explanation Based Learning

Case Based Learning

Linear Regression

Locally Weighted Regression

Fig. 77: Evolutionary Computation Applications to Agents

Fig. 78: AI Applied to Agency in a Distributed System

Agent requests AI application to solve problem at specific location — 7675

Agent accesses AI computation resources at specific location — 7680

Agent identifies optimal AI application by using filter that tests GA, GP & NN for specific use — 7685

7690 — Agent seeks new use of AI

Agent applies AI efficiently to specific use — 7695

Agent completes session — 7700

Fig. 79: Evolutionary Computation Architecture and AA/INA Applications

7715

GA

7725

NN

7740 Other evolution-
ary computation
methods

7745 Multiple EC
approaches

Genetic
programming
module(s) 7720

7730 Breeding
optimal
programs

7735 Efficiency
Module

Evolutionary pro-
gram(s) created,
tested & optimized 7750

7755 Expert
System

Inference
engine 7760

7765 Buyer or Seller
AA outputs

7770 Non-intentional
approaches to
disguise negotia-
tion strategies

Optimal negotia-
tion approaches 7775

7780 Forecasting

Analysis

7785

INAs

7790

Auction
typologies
for B-INA &
S-INA

7795

Collaborative
filtering

Syntheses

7805

7800

Fig. 80: Layered AI For Optimum Agent Mobility

[AAs & ITAs tend to be closer to home base because of need for maximum computing resources]

7860
Home base with substantial computing resources: AI, EC, GP, GA, NN, FL, etc.

7865
Most efficient AI use (minimum necessary)

7875

7870
Launch agent(s)

7885
Agent makes initial determination of minimum computation resources needed for expected activity based on initial (pre-negotiation) interaction

7880
Agent seeks reserve layers of AI

Parallel use of various AI for faster computation

Alternating uses of various AI methods for most effective computation

7890

7895
Agent enters into interactions or analysis using specified AI function levels at specified locations

Agent com-pletes function & terminates

7897

Agent selects opti-mal methods of AI, GP, GA, NN, FL, EC, etc.

7905

7900
Agent discovers need for increased AI to perform increased functions

7910
AI filters

7915
Agent seeks out most effective use of AI functions

7920
As agent interacts with increasing mobility (e.g. INAs) it needs a balance between less AI for fast/light mobility and more AI for sophistication

7940
Increased calculations needed for increased number or complexity of agent activities (complex interactions or less time frames)

7930
Agent dis-ables unnec-essary code

less

more

Increased mobility with lighter load

7935

7945
Return to home base for more computing resources

Fig. 81: Analytical Agent System Architecture
Buyer vs. seller viewpoints

Fig. 82: Kinds Of Data Analysis & Syntheses

8105 — Market Data (various sources)

8115 — Seller Analytical Agents

8110 — Buyer Analytical Agents

8120 — Collaborative filtering

8125 — Editorial retailing

8130 — Expert System

8135 — Multi-attribute regression analysis

8145 — Statistical scenarios

8150 — Syntheses

8155 — Third party opinions

8160 — Mass personal-ization of data

8165 — Synthesis

8170 — Filter & synthesize data to buyer from initial parameters

8175 — Targeted informa-tion

8180 — Systematic Report

8185 — Forecasting

8190 — Combining analysis

8195 — Custom report

8200 — Recommendation report

8205 — Advice report

Fig. 83: Analytical Agent Data Flow Process

8255 — Market Data (various sources, translated into codes)

8260 — Analytical Agent

8265 — Services

Superscore

Economic analysis

Accountability Index

Financial criteria index

Insurance & financial risk management

RMO's

8270

Promotions

Aggregation

Arbitrage

Market analysis

Industry analysis

Company analysis

Competition analysis

Product analysis

8275

Fig. 84: Data Mining Approaches
CSA & AA interactions

8305 — Market data

8310 — Methods of data discovery from distributed sources

8315 — Search
8320 — Specific Query
8325 — General Query
8330 — Time Sensitive query
8335 — Targeted information collection

8340 — Local databases
8345 — By Item
8350 — By company
8355 — By category
8360 — By industry
8370 — Specific customer requirements

Global databases

8380 — Showcase db analysis

8365 — In real time

8375

8390 — Data Analysis
8395 — Predictions

8385 — Data Syntheses

8400 — Create Profiles

8405 — Create report

8410 — Scenarios

8415 — AA

Fig. 85: Advanced Collaborative Filtering for Cross Marketing Recommendations

Showcase — 8455

S-AA — 8460

B-AA — 8465

Request info on item(s) of interest to customer — 8470

Analyze similar customers purchasing similar items at multiple locations — 8475

CSA

8480

B-Inter-agent — 8485

B-AA — 8495

Filtration process based on: 8490

Item type	Popularity	Region	Quality	Services	Bundles	Quantity	Price range

Analysis: Statistically rank new items of interest to customers with similar interests based on initial item — 8500

Push recommended items to customer as promotions — 8505

Recommend other items associated with purchase of current item — 8510

New purchase data is added to database

Present customer with list of recommended items — 8515

Customer acquires recommended item(s) — 8525

Fig. 86: B-AA Operations With Mobility

8550 — B-INA (or B-ITA) requests analysis from B-AA

8555 — B-AA activates analysis at specific location

8560 — B-AA moves to remote location to collect data (or import data)

8565 — B-AA moves to multiple remote locations to collect data

8570 — B-AA performs analysis on data

8575 — B-AA organizes analysis and issues report

8580 — B-AA performs synthesis on data by combining data sets

8585 — B-AA organizes data syntheses and issues a report

8590 — B-AA applies analysis or synthesis to B-INA (or B-ITA) function at specific location by exporting reports

8600 — B-AA completes session

Fig. 87: Super-Score System: Negotiated Variables

1. Object Description – need reference to adaptable tables
2. Seller Description
3. Buyer Information
4. Buyer Credit Data
5. Finance opportunities – credit
6. Seller Promotions
7. Risk Management Options
8. Market Data on Multiple Sellers & Buyers

1	2	3	4	5	6	7	8

9. Industry Code
10. Unit Quantity
11. Unit Quality
12. Time to deliver
13. Bundling code — discounts
14. After Sales rating code
15. Quantity Code – each # signifies group category 1-100, 100-1000 etc.
16. Location of Negotiations

9	10	11	12	13	14	15	16

Fig. 88: Economic/Market Analysis Variables

1. Industry Code
2. Industry Analysis
3. Product Analysis
4. Need Index of average prices for each main sector – trends, changes
5. Prices relative to market averages
6. Intra-company analysis of products/services – scope, growth rate change, etc. analysis of data
7. Probability scenarios of industry company
8. Broad Market Analysis (as service)
9. Economic indicators

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
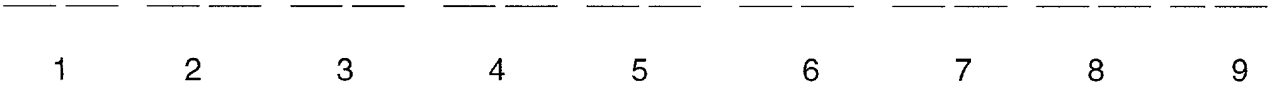
Fig. 89: Accountability Index System Variables

1. Bidding History
   a. % bid
   b. # of bids
   c. % of bids won
   d. # of bids won
2. Follow Up History
   a. # & re-negs
   b. # & returns
3. Credit History
   a. credit limit
   b. credit growth
4. Risk Factors
   a. fast changes outside
5. Flexibility ratio
   a. customer/seller as less rigid to accept deal
6. Tracking Pattern of Negotiation
   a. figuring into accountability index
7. Transaction Prior Experiences
   a. bidding history
   b. success
   c. problems
8. Follow through ratio
9. Accountability Index
10. Specify factors
11. Credit factors
    a. debt ratio to net worth
    b. paying on time
    c. use up to limits, floating debt
    d. credit limits
    e. # of accounts
    f. risk of default
12. Identify/authenticate agent/entity
13. Responsiveness to requests
    a. In time factor

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| 9 | 10 | 11 | 12 | 13 |

Fig. 90: Financial Criteria Index System

30+ Digit Code

1. Net Worth
2. Income
3. Cash Flow
4. Level of Debt to net worth
5. Public records
6. Value of assets
7. How much credit limit is used
8. How often up to (or over) limit
9. Financial Criteria factors
10. Length of credit accounts
11. Credit Limit
12. Unsecured vs. Secured debt
13. Derogatory Credit – over limit past due
14. Number of moves
15. Frequency of Place
16. Final Index Number to put in Super Score

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

Fig. 91: Insurance Risk Factors

1. Use of Stats to establish rates
2. Kinds of losses specified
3. Claim-Adjustment Procedures
4. Claims Procedures
5. Errors
6. Omissions
7. Fraud
8. Accident
9. Premium Accounts
10. Limits/amounts of insurance
11. Full vs. Partial losses
12. Entity past record of claims
13. Costs of losses
14. Risks of specific events
15. Risk of limited loss
16. Risk of total loss

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

Fig. 92: List Of Services

1. ITA (Transactions)
    a. Actual banking services
    b. Aggregation (for better deals)
    c. Insurance
    d. Warranties
    e. Payment Processing
    f. Tax Collection & Payments
    g. Escrow
    h. Due Diligence
    i. Legal, tax, customs
    j. Compliance
    k. Accounting
    l. Shipping/delivery
    m. Delivery tracking
    n. Post-sale reporting
2. AA (Analysis)
    a. Economic analysis
    b. Market/industry analysis
    c. Company, product & service analysis
    d. Financial & credit analysis
    e. Accountability Indices
    f. Superscore
3. Risk Management Options
    a. Penalties for sellers not fulfilling by specified time
    b. Risk priorities – order of preferred risks
    c. Arbitrage penalties
    d. Option swaps (exchanging opposing kinds of risks)
    e. Dynamic pricing of risks based on peak/low risks environment
    f. MTO Penalties
    g. JIT Penalties
    h. Risk Sharing

4. Promotions (CSA)
    a. Discounts
    b. Aggregation (group discounts)
    c. Promotional guarantees
    d. Promise to provide item by specific time
    e. Quality increase offer
    f. Bundling products & services
5. Insurance Risk Management
    a. Liability (product/service, business, individual)
    b. Dynamic pricing based on peak risks
    c. E&O Fraud risks
    d. Risk of event loss
    e. Re-insurance – Insurance risk sharing
    f. Accident risks
    g. Degrees of losses
6. Financial Risk Management
    a. Credit analysis /buyer, seller
    b. Secured debt – kinds of assets
    c. Unsecured debt
    d. Structured fin.-by asset category (securitization of assets/debt)
    e. Packaging debt
    f. Packaging Ins. & Fin. Opportunities
7. Additional Services
    a. Bundling products &/or services
    b. Customized orders
    c. Mass-customization
    d. Just-in-time items
    e. Aggregation of bundles
    f. Arbitrage of items & bundles
    g. Computation resources
    h. Bandwidth resources